CORNELL UNIVERSITY OFFICIAL PUBLICATION

Announcement of the

Graduate School

for 1942-43

VOLUME 33 : MARCH 15, 1942 : NUMBER 15

THE GRADUATE SCHOOL

ADMINISTRATION

EDMUND EZRA DAY, S.B., A.M., Ph.D., LL.D., *President of the University.*
GEORGE HOLLAND SABINE, Ph.D., *Dean of the Graduate School.*

GENERAL COMMITTEE OF THE GRADUATE SCHOOL

1941–42

Professor O. F. CURTIS, *at large, term expires* 1942.
Professor P. F. SHARP, *at large,* 1943.
Professor P. J. KRUSE, *at large,* 1944.
Professor L. A. MAYNARD, *at large,* 1944.
Professor HARRY CAPLAN, *Group A* (*Languages and Literatures*), 1942.
Professor S. W. WARREN, *Group B* (*History, Political Science, Philosophy Psychology, Agricultural Economics, Farm Management, Rural Sociology*), 1944.
Professor H. A. BETHE, *Group C* (*Mathematics, Astronomy, Physics, Chemistry, Geology, Geography, Geodesy*), 1944.
Professor C. McC. MOTTLEY, *Group D* (*Biological Sciences*), 1943.
Professor W. L. MALCOLM, *Group E* (*Engineering, Architecture, Applied Physical Sciences, Rural Engineering, Landscape Design*), 1942.
Professor C. V. MORRILL, *Group F* (*Preclinical Departments of the Cornell University Medical College in New York City*), 1943.
Professor RICHARD BRADFIELD, *Group G* (*Agricultural Sciences*), 1943.
Professor H. D. LAUBE, *Group H* (*Law*), 1944.
Professor E. N. FERRISS, *Group I* (*Education*), 1942.
THE SECRETARY OF THE FACULTY.
THE DEAN, *Chairman ex officio.*

The Office of the Graduate School is in Morrill Hall (second floor). The office hours are 8:30 to 4.

CORNELL UNIVERSITY OFFICIAL PUBLICATION

PUBLISHED BY CORNELL UNIVERSITY AT ITHACA, N. Y.

Monthly in September, October, and November
Semi-monthly, December to August inclusive

[*Entered as second-class matter, December 14, 1916, at the post office at Ithaca, New York, under the act of August 24, 1912*]

CALENDAR OF THE GRADUATE SCHOOL FOR 1942–43

SUMMER 1942

1942

May 1 — Last day for new students to file applications for admission to the Graduate School for the Summer Sessions.

May 25–June 27 — First five-week Summer Session. For the list of courses see the Announcement of the Cornell University Summer Session.

June 1–Sept. 12 — Summer Terms in the Law School, the Colleges of Engineering and Architecture, and the New York State Veterinary College. Address all correspondence with regard to these to the Secretary of the School or College concerned.

June 29–Aug. 8 — Six-week Summer Session. For the list of courses see the Announcement of the Cornell University Summer Session.

June 29–Sept. 12 — Eleven-week Summer Session. For the list of courses see the Announcement of the Cornell University Summer Session.

July 6–Sept. 22 — Summer Term of the Medical College. Address all correspondence with regard to this to the Dean of the Medical College of Cornell University, 1300 York Ave., New York, N. Y.

Aug. 10 — Last day for new students to file applications for admission to the Graduate School for the first term of 1942–43.

Aug. 10–Sept. 12 — Second five-week Summer Session. For the list of courses see the Announcement of the Cornell University Summer Session.

Sept. 16 — Last day for payment of graduation fee for candidates for September degrees.

Sept. 26 — Last day for completing requirements for advanced degrees to be conferred in September.

FIRST TERM

Sept. 28 — Registration of new students.

Sept. 29 — Registration of old students.

Oct. 1 — Instruction begins.

Oct. 12 — Last day for filing statement-of-courses blanks, change-of-committee blanks, and for new students to file candidacy blanks to receive residence credit for the term.

Oct. 19 — Last day for taking qualifying examinations for Ph.D. in order to have them considered as of the beginning of the term.

Oct. 22 — Last day for payment of tuition for the first term.

Oct. 26 — Last day for taking language examinations in order to have them considered as of the beginning of the term.

Nov. 26 — Thanksgiving holiday.

Nov. 30 — Last day for announcing titles of theses by candidates for advanced degrees to be conferred in May, 1943.

Dec. 19 — Instruction ends at 12:50 P.M.

Christmas Recess

1943

Jan. 4 — Instruction resumed at 8 A.M.

Jan. 9 — Last day for new students to file applications for admission to the Graduate School for the second term.

Jan. 23 — Last day for payment of graduation fee for candidates for January degrees.

Jan.	25	Last day for completing requirements for advanced degrees to be conferred in January.
Jan.	28	Term ends.

SECOND TERM

Jan.	29	Registration.
Jan.	30	
Feb.	1	Instruction begins.
Feb.	15	Last day for filing statement-of-courses blanks, change-of-committee blanks, and for new students to file candidacy blanks to receive residence credit for the term.
Feb.	19	Last day for taking qualifying examinations for Ph.D. in order to have them considered as of the beginning of the term.
Feb.	22	Last day for payment of tuition for the second term.
Feb.	28	Last day for taking language examinations in order to have them considered as of the beginning of the term.
March	1	Last day for filing applications for fellowships and scholarships for 1943–44.
March	27	Instruction ends at 12:50 P.M.

Spring Recess

April	5	Instruction resumed at 8 A.M.
April	10	Last day for making application for May, 1943, degrees.
April	26	Examination period for May degrees.
May	17	
May	14	Last day for payment of graduation fee for candidates for May degrees.
May	17	Last day for completing requirements for advanced degrees to be conferred at Commencement.
May	24	COMMENCEMENT.

CONTENTS

It is the policy of Cornell University during the national emergency to offer full-time instruction throughout the calendar year in all those colleges and departments in which this practice is feasible. The Graduate School will permit accelerated programs of study, at the rate of three terms a calendar year instead of two terms, in all cases where the facilities for such study can be made available. By action of the Faculty, the Dean of the Graduate School is authorized to suspend all regulations relating to work done during the summer that would interfere with such programs.

GENERAL INFORMATION

THE FACULTY OF THE GRADUATE SCHOOL

The Faculty of the Graduate School has exclusive jurisdiction over all graduate work and advanced degrees. It consists of three groups: (1) an *ex-officio* group, including the President of the University, who is the presiding officer, the Deans or Directors of the several Faculties of the University, and the Directors of the Experiment Stations; (2) a variable academic group consisting of those professors, associate professors, assistant professors, and instructors who, as members of special committees, are actively engaged in supervising the work of graduate students; (3) a permanent academic group including those members of the University Faculty who, during five consecutive years, have been members of group (2).

Professors, associate professors, assistant professors, instructors who hold the Doctor's degree, and such other members of the teaching or research staff of the University as the Faculty may authorize are eligible for membership on the Special Committees which supervise the work of graduate students.

The General Committee of the Graduate School is the chief administrative body of the Faculty. It is composed of thirteen members elected by the Faculty and two members *ex-officio* (see page 2). It is the duty of the General Committee to pass upon questions which do not involve a change of policy; to consider such matters as may be referred to it by the Faculty; and upon its own initiative to make recommendations to the Faculty regarding questions involving the interests of the Graduate School.

DEGREES OFFERED

It is the purpose of the Graduate School to offer facilities for advanced study and research, to the end that adequately trained students may receive a comprehensive view of a field of knowledge and the training required for independent investigation in that field. The requirement for receiving an advanced degree is a high grade of scholarly work rather than the fulfillment of routine requirements.

The following degrees are offered:

Master of Arts (A.M.)
Master of Science (M.S.)
Master of Science in Agriculture[1] (M.S. in Agr.)
Master of Fine Arts[2] (M.F.A.)
Master of Architecture[2] (M.Arch.)
Master of Landscape Architecture[2] (M.L.A.)
Master in Regional Planning[2] (M.R.P.)

[1]Open only to students who have had a four-year course in Agriculture or the equivalent.

[2]Under the special jurisdiction of the Division of Architecture and Fine Arts.

Master of Science in Engineering[3] (M.S. in Eng.)
Master of Chemical Engineering[3] (M.Chem.E.)
Master of Civil Engineering[3] (M.C.E.)
Master of Electrical Engineering[3] (M.E.E.)
Master of Mechanical Engineering[3] (M.M.E.)
Master of Laws[4] (LL.M.)
Master of Education[5] (M.Ed.)
Master of Science in Education[5] (M.S. in Ed.)
Doctor of the Science of Law[4] (J.S.D.)
Doctor of Philosophy (Ph.D.)

ADMISSION TO THE GRADUATE SCHOOL

An application for admission should be made on the proper form, which will be supplied at the office of the Graduate School. No application will be acted upon until all the credentials enumerated in this form have been filed.

Inquiries about admission should be addressed to *The Graduate School, Cornell University, Ithaca, New York.* Inquiries about facilities for advanced study and research may be addressed to the Department in which such work is done, or to the Division under whose jurisdiction the degree is granted.

For admission in September, applications with all supporting documents should be filed by August 10; for admission in January, by January 9; and for admission in the summer, by May 1. Applications filed later than these dates may fail of consideration in time for registration at the beginning of the term following.

To be admitted to the Graduate School an applicant (1) must hold a baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for such a degree; (2) as judged by his previous scholastic record, or otherwise, must show promise of ability satisfactorily to pursue advanced study and research; and (3) must have had adequate preparation to enter upon graduate study in the field chosen.

A senior in one of the colleges of Cornell University who has completed the academic requirements for a Bachelor's degree, and who qualifies under (2) and (3), may be admitted to the Graduate School, provided his admission is approved by the dean of his college.

An applicant is admitted to the Graduate School in one of the following categories: (1) a candidate for a degree; (2) a non-candidate; (3) a resident doctor.

Candidates. Students admitted to the Graduate School usually pursue a course leading to one of the advanced degrees. The work of a candidate for a degree is directed by a Special Committee, selected by the student, as explained below (see page 16).

---

[3]Under the special jurisdiction of the Division of Engineering.
[4]Under the special jurisdiction of the Division of Law.
[5]Under the special jurisdiction of the School of Education.

Candidates for the degrees A.M., M.S., M.Arch., M.L.A., or M.F.A. are expected to have had training in a foreign language equivalent to three entrance units, or in two foreign languages equivalent to two entrance units each. If an applicant cannot offer such training, a longer period of residence is required for the degree. See below, page 15.

A candidate for an advanced professional degree given under the jurisdiction of some division of the Graduate School should examine the special requirements for the degree printed at the beginning of the announcement for the division which has jurisdiction over it.

Non-candidates. A properly qualified person who, for valid reasons, does not wish to meet the requirements for a degree may be admitted to the Graduate School as a "non-candidate" and may arrange a program of graduate study suitable to his purposes. A non-candidate is required to select from the members of the Graduate Faculty an adviser to direct his work. He must file with the Dean not later than two weeks after his first registration a statement of the field in which he wishes to work, approved by his adviser. A non-candidate is expected to pursue a coördinated program of graduate work, and his courses must as a rule be chosen from those titled in bold-faced type in this Announcement. Each term he must file a statement of the courses which he means to pursue, approved by his adviser.

Resident Doctors. Persons who hold the Doctor's degree or who have equivalent standing may, with permission from the Dean, be admitted to the Graduate School as Resident Doctors, for the purpose of engaging in advanced study and research in a field in which they have had adequate preparation. On the recommendation of the Dean, Resident Doctors are exempt from the payment of tuition and all fees except laboratory charges. Ordinarily they are not permitted to attend classes.

Medical Requirements

Every student matriculating in the University is required to present a satisfactory certificate of vaccination against smallpox. This must certify either to a successful vaccination within the five years preceding matriculation or to at least three unsuccessful attempts at vaccination within that period.

Within a month preceding or a month following matriculation every student must submit to the University Health Officer for permanent filing, a satisfactory chest radiograph taken within this two-month period. Such radiographs are made at the Infirmary at a special rate charged to students.

Registration

The rules of the University provide: "All students taking work in the Graduate School or work leading to, or in contemplation of, an advanced degree, shall, at the beginning of each term or session, register both in the Graduate School and with the Registrar of the University."

Candidates for advanced professional degrees shall register also with the division concerned.

A graduate student who has completed the requirements of residence for his degree and who remains in residence while working on his thesis or while doing other work in contemplation of a degree must register each term in which he is thus engaged.

A graduate student who returns to the University to present his thesis and to take the final examination for an advanced degree, all other work for that degree having been previously completed, shall register as a "candidate for degree only" and shall pay only an administration fee of $12.50.

A graduate student who discontinues his work for any reason during a term in which he is registered should immediately report this fact at the office of the Graduate School.

REQUIREMENTS FOR THE MASTER'S DEGREES

Residence Requirements

The minimum residence requirement for master's degrees is two terms.

Before he may be awarded any degree conferred by Cornell University, a student must have spent at least one full academic year, or the equivalent, in residence at the University and in study for that degree. In consequence, graduate work done elsewhere cannot be counted to reduce the residence requirement for a master's degree below one year.

To receive credit for residence a candidate must be regularly enrolled in the Graduate School. The satisfactory completion of his work, term by term, must be attested by the members of his Special Committee.

The amount of residence credit granted to a candidate who holds an appointment as instructor, as a teaching or research assistant, or who is acting in any capacity involving a significant loss of time from his graduate work, shall be determined by the General Committee of the Graduate School, upon recommendation of the student's Special Committee. In no case shall such credit exceed three-fourths, and in the case of full-time instructors one-half, of full residence credit.

A candidate for an advanced degree is expected to complete his residence with reasonable continuity. All work for an advanced degree, including the final examination, must be completed within four years after the minimum residence requirement for the degree has been satisfied.

Residence credit in the Summer Session.[1] For A.M., M.S., and M.S. in Agr., residence during Summer Sessions may be counted at the rate of three Summer Sessions for one term of credit, and five sessions

[1]This rule applies to the Summer Sessions of five or six weeks. When a summer term is given, equivalent in length to one of the terms of the academic year, a graduate student may receive a full term of residence credit.

for two terms; for all other master's degrees at the rate of two Summer Sessions for each term of credit.

To obtain residence credit in the Graduate School for work done in the Summer Session the candidate must register both in the Summer Session and in the Graduate School. He must file in the office of the Graduate School within one week after registration a statement of courses as provided for students in the regular session (see page 16).

Additional requirement of residence for deficiency in foreign language. Candidates for the degree of A.M., M.S., M.Arch., M.L.A., or M.F.A., are subject to the following special requirement in foreign language, which may affect the amount of residence required of them.

(a) A candidate must have had training in a foreign language equivalent to three entrance units, or in two foreign languages equivalent to two entrance units in each; or

(b) If he lacks such training he must, at the beginning of his candidacy (i.e., within one month after registration), prove his ability to read either French or German (or another language other than English approved by his Special Committee) by passing an examination given by a member of the Language Examination Board.

(c) An applicant who, at entrance, cannot meet either of the requirements (a) or (b), but who is otherwise qualified for admission, may be admitted to candidacy subject (1) to presenting three terms of residence (instead of two) for graduation and (2) to demonstrating, before a member of the Language Examination Board not later than the beginning of his last term of residence, a reading knowledge of a foreign language as provided above. The General Committee of the Graduate School, upon the recommendation of the student's Special Committee, may waive the requirement of an extra term of residence, provided preparation in foreign language is made during a period when the student is not receiving residence credit.

Requirements in Course

Two plans of procedure are offered to candidates for master's degrees, described below as Plan A and Plan B.

Plan A. Open to candidates for A.M., M.S., M.S. in Agr., M.F.A., M.Arch., M.L.A., M.R.P., M.S. in Eng., M.Chem.E., M.C.E., M.E.E., or M.M.E.

Plan A is intended for those candidates who wish to acquire a considerable degree of competence in a restricted field of work, frequently as a basis for further study and research, or for professional purposes.

The candidate works under the direction of a Special Committee, usually of two faculty members, representing a Major and a Minor Subject. He is required to present a thesis or an essay acceptable to his committee and to pass a final examination.

Major and Minor Subjects. A list of approved Major and Minor Subjects will be found below, in the announcement of each department of instruction. Before selecting his Major and Minor Subjects

the student should consult members of the Faculty regarding suitable combinations of subjects. Ordinarily the candidate will devote the major portion of his time—say something over one-half—to his Major Subject, and the remainder to his Minor Subject, the exact division being determined by his Committee. The requirements may consist of work in formal courses, informal work in seminars, or assigned reading or study and research—in the discretion of the Special Committee. There are no requirements in semester hours under Plan A.

Special Committees. After the candidate has chosen his Major and Minor Subjects, he must select at least one member of the Faculty to represent each subject and to serve as the members of his Special Committee. The representative of the Major Subject is the chairman. Not later than two weeks after his first registration in the Graduate School a candidate must file, on the proper blank, a statement of the Major and Minor Subjects which he has selected. This statement must be signed by each member of the Special Committee as an indication of his approval and consent to serve on the committee.

A student may change the membership of his Special Committee with the approval of all the members of the newly constituted Committee. Notice of such change must be filed immediately with the Dean of the Graduate School. A vacancy on a Special Committee, caused by the absence of a member from the University, may be filled by the Dean on joint recommendation of the student and the members concerned.

Statement of Courses. At the beginning of each term a graduate student shall make out in duplicate a list of all the courses which he plans to take during the term and shall have this list signed by the chairman of his Committee as an indication of approval. The chairman of the Committee shall retain one copy; the duplicate copy shall be filed in the office of the Graduate School within two weeks after registration. Courses primarily for undergraduates, printed in italics, are ordinarily not open to graduate students.

Thesis or Essay. A candidate for any of the masters' degrees under Plan A must complete an acceptable thesis, or, in the discretion of his Special Committee, an essay. The subject of the thesis, or essay, approved by the chairman of the Committee, must be filed with the Dean six months before the candidate intends to complete all the requirements for his degree. The thesis, or essay, is ordinarily written in the candidate's major field and under the direction of the chairman of his Special Committee. It must be approved, however, by all members of the Committee. For this purpose it should be in the Committee's hands at least fifteen days before the final examination; and during the five days immediately preceding this examination a typewritten copy, approved by all members of the Special Committee, must be on file in the office of the Graduate School.

The thesis must be typewritten, double spaced, on a durable rag bond, 8 x 10½ inches, with a left-hand margin of at least an inch

and a quarter. The carbon copy need not be on bond paper. The title-page should be set up according to the following form:

[TITLE OF THESIS]
A Thesis
Presented to the Faculty of the Graduate School of Cornell University for the degree of
[————————————]
By
[Author's Name in Full]
[Date on which degree is to be conferred.]

Immediately following the title-page there must be a biographical sketch of the author, in length not exceeding 150 words.

Before the degree can be conferred two[1] bound typewritten copies (one of which must be a ribbon copy) of the completed thesis, approved by the Special Committee, must be deposited in the office of the Graduate School. These copies become the property of the University Library.

When the Major Subject for the degree of Master of Architecture or the degree of Master of Landscape Architecture is in Design, the candidate is required to deposit, in place of the thesis, either his original drawings or a photographic reproduction of them.

Final Examination. After the thesis, or essay, has been completed and filed in the office of the Graduate School, as provided above, and after the required period of residence has been substantially completed, the candidate is required to present himself for the final examination. No candidate may proceed to the final examination until the other requirements for his degree have been completed, except that the final examination may be given near the end of the candidate's last term of residence. The examination covers the thesis and the Major and Minor Subjects. It may be written or oral, or both, at the option of the Special Committee.

An application for final examination, approved by the Special Committee, must be filed in the office of the Graduate School at least five days in advance of the examination, except that candidates for May degrees must file applications not later than April 10.

Final examinations are conducted by the student's Special Committee and are open to all members of the Faculty. At the discretion of the Special Committee those under whom the student has worked may be invited to participate in the examination. But the Special Committee alone shall decide upon the merits of the candidate's performance.

A report on each final examination, whether passed or failed, shall be filed by the Special Committee in the office of the Dean. A can-

[1]The candidate should consult the chairman of his committee to ascertain if additional copies are required by the department.

didate who has failed in a final examination may not be re-examined within three months.

Plan B. Open to candidates for A.M., M.S., or M.S. in Agr.

Plan B is designed for those who wish a somewhat broader training than is permitted under Plan A. It is intended to meet the needs of prospective or in-service teachers in secondary schools and of others who wish to supplement a four-year college course by an additional year of study at the graduate level. The candidate, working under the direction of a Special Committee, is required (1) to complete satisfactorily a minimum of thirty semester hours of work, comprising (a) work in formal courses and in seminars including such examinations as may be given therein; and (b) either an acceptable expository or critical essay or problem in research, or, if he prefers, a formal thesis: and (2) to pass a final comprehensive examination.

Fields of Concentration. Of the thirty semester hours in formal courses, seminars, and the like required of a candidate working under Plan B, approximately one-half must be in a field of concentration chosen by the candidate; and the remainder may be distributed in that field and in related fields, in the discretion of the candidate's Special Committee, as best meets his needs. Fields of concentration are broader than major and minor subjects specified under Plan A.

The following is a provisional list of fields of concentration from which selection may be made; but the student's choice is not limited to this list. If none of these is suitable, he should consult the Dean of the Graduate School or the professors in the field in which he is interested.

Agricultural Economics
Biological Sciences
Education
English
Fine Arts
Foreign Languages
Home Economics
Mathematics
Physical Sciences
Speech and Drama
Social Studies
Technical Agriculture

Special Committees. After the candidate has chosen his field of concentration, he must select two members of the Faculty to serve as his Special Committee. One of these, who is chairman of the committee, must represent the field of concentration, the other may be chosen from either that field or some related field, depending on the candidate's program. The committee members' consent to serve, together with a statement of the field of concentration approved by both members of the Committee, must be filed with the Dean of the Graduate School, on the proper blank, not later than two weeks after first registration.

A student may change the membership of his Special Committee with the approval of all the members of the newly constituted Committee. Notice of such change must be filed immediately with the Dean of the Graduate School. A vacancy on a Special Committee, caused by the absence of a member from the University, may be filled by the Dean on joint recommendation of the student and the members concerned.

Statement of Courses. At the beginning of each term a graduate student shall make out in duplicate a list of all the courses which he plans to take during the term and shall have this list signed by the chairman of his Committee as an indication of approval. The chairman of the Committee shall retain one copy; the duplicate copy shall be filed in the office of the Graduate School within two weeks after registration. Courses primarily for undergraduates, printed in italics, are ordinarily not open to graduate students.

Thesis, Research, or Essay. A substantial part of the candidate's work in the field of concentration shall be devoted to studies requiring investigation, organization of material, and criticism. Whether the candidate is to meet this requirement by work in seminars, by writing an essay or a thesis, or in some other way is left to the Special Committee in consultation with the student. If a thesis is required, the candidate must follow the procedure for presenting theses outlined under Plan A, page 16.

The Special Committee will report to the office of the Graduate School the semester-hour equivalent and the grades for the thesis or the essay, or for other work, not otherwise reported in formal courses, done by the candidate in meeting this requirement.

Final Examination. After the candidate has substantially satisfied the minimum period of residence and has satisfactorily completed at least thirty semester hours of work approved by his Special Committee, he must present himself for the final comprehensive examination. No candidate may proceed to the final examination until the other requirements for his degree have been completed, except that the final examination may be given near the end of the candidate's last term of residence while he is still taking courses required for the degree. Eligibility for the final examination depends on satisfactory progress in those courses, and their completion is essential to meeting all requirements. The examination covers the thesis or essay, if presented, as well as work done in formal courses and seminars. The examination may be written or oral, or both, at the option of the Special Committee.

An application for final examination, approved by the Special Committee, must be filed in the office of the Graduate School at least five days in advance of the final examination, except that candidates for May degrees must file applications not later than April 10.

Final examinations are conducted by the student's Special Committee and are open to all members of the Faculty. At the discretion of the Special Committee those under whom the student has worked

may be invited to participate in the examination. But the Special Committee alone shall decide upon the merits of the candidate's performance.

A report on each final examination, whether passed or failed, shall be filed by the Special Committee in the office of the Dean. A candidate who has failed in a final examination may not be re-examined within three months.

Special Requirements for Professional Degrees

The following special requirements apply in the case of the professional masters' degrees enumerated.

Master of Laws, LL.M. The degree LL.M. is intended primarily for those who desire to increase their knowledge of the law by work in special fields. In addition to meeting the general requirements for admission given on page 12, the candidate must have received the degree of Bachelor of Laws from an approved law school and must have shown a high level of professional ability. To complete the requirements for the degree the candidate (1) must work for a minimum period of two terms under the direction of a Special Committee of three, chosen by the candidate, after consultation with the chairman of the Division of Law, from the Faculty in Law and related fields (such as Economics, Government, History, and Philosophy); (2) shall complete with high merit such a program of instruction and investigation as shall be approved by his Special Committee and acceptable to the Division; (3) must demonstrate his ability creditably to pursue research in Law by the submission of articles or reports; and (4) must pass with superior standing a final examination and such other examinations as shall be required by his Special Committee and acceptable to the Division. For further information see page 188 of this *Announcement* and also the *Announcement of the Cornell Law School.*

Master of Education, M.Ed. This degree is awarded at the end of the fifth year of the five-year program for the preparation of secondary school teachers. Though a brief statement regarding the program for this degree is presented on page 140 of this *Announcement,* complete information may be found in the *Announcement of the School of Education.* Prospective candidates should communicate with the Director of the School of Education, 211 Stone Hall, Ithaca, N. Y.

Master of Science in Education, M.S. in Ed. This degree is designed for persons of experience who wish to prepare themselves for specialized forms of educational work. The candidate, working under the direction of a Special Committee for a minimum of two terms, is required to complete an approved program of study adjusted to his needs. The candidate is required to pass a comprehensive final examination. For further details see page 140 of this *Announcement.*

Master of Fine Arts, M.F.A., with major in the History and Practice of the Fine Arts. This degree is designed for students whose undergraduate major in the history and practice of the fine arts prepares them for advanced work. The graduate work requires two years with

a specified curriculum. See page 44; and for details consult the Dean of the College of Architecture.

Masters' Degrees in Engineering. For special requirements, see the announcement of the Engineering Division, below, page 146.

REQUIREMENTS FOR THE PH.D. DEGREE

Work leading to the Ph.D. degree is designed to give the candidate a thoroughly comprehensive view of a field of knowledge and to train him in methods of research and scholarship in that field. A candidate is expected to maintain a high grade of achievement and to show evidence of ability in independent investigation and study. The requirements for the degree include (1) six terms of residence as a graduate student; (2) the satisfactory completion, under the direction of a Special Committee, of work in one Major Subject and two Minor Subjects; (3) certain requirements in foreign language; (4) the presentation of an acceptable thesis; and (5) the passing of a qualifying examination and a final examination.

Residence Requirements

For the Ph.D. degree a minimum of six terms of residence is required; or seven terms if the candidate does not pass one of the examinations in foreign language (see requirements in foreign language) on beginning candidacy at Cornell University.

To receive credit for residence a candidate must be regularly enrolled in the Graduate School. The satisfactory completion of his work, term by term, must be attested by the members of his Special Committee.

No candidate may earn more than two terms of residence credit in any twelve-month period except with the permission of the Dean in special cases. (This rule is suspended to permit accelerated programs of study during the emergency.)

The amount of credit granted to a candidate who holds an appointment as instructor, as a teaching or research assistant, or who is acting in any capacity involving a significant loss of time from his graduate work, shall be determined by the General Committee of the Graduate School, upon recommendation of the Special Committee. In no case shall such credit exceed three-fourths, and in the case of full-time instructors one-half, of full residence credit.

A candidate for an advanced degree is expected to complete his residence with reasonable continuity. All work for an advanced degree, including the final examination, must be completed within four years after the minimum residence requirement for the degree has been satisfied.

At least two of the last four terms, and ordinarily the last two, must be spent in consecutive regular terms (other than the five-or six-week Summer Sessions) at Cornell University.

Residence Credit for a Master's Degree. Residence credit earned as a candidate for a master's degree, either at Cornell or elsewhere, may

be credited toward the Ph.D. degree. Normally not more than two terms of credit may be gained in this way, and the transfer requires the recommendation of the Special Committee.

Credit for Work in Other Universities. Upon the recommendation of the student's Special Committee residence up to a maximum of four terms may be credited toward the doctor's degree for work done in other universities. Application for such credit should be made by the student as soon as possible after registration, and not later than the end of the first term of residence at Cornell.

Residence in Summer Sessions.[1] To obtain residence credit in the Graduate School for work done in the Summer Session the candidate must register both in the Summer Session and in the Graduate School. He must file in the office of the Graduate School within one week after registration a statement of courses, as provided for students in the regular session (see page 16). For the Ph.D. degree residence during Summer Sessions may be counted at the rate of three Summer Sessions for one term of credit, and five Sessions for two terms.

Credit toward the Ph.D. degree earned in Summer Sessions at Cornell or elsewhere is ordinarily limited to two terms. A candidate who has already earned two terms of credit by work in Summer Sessions and who has demonstrated ability in graduate work may, however, upon recommendation of his Special Committee and with the approval of the General Committee, earn one more term of credit by work in Summer Sessions at Cornell, with the privilege of credit for an additional term for research under personal direction. In this case, however, the last year of candidacy must be spent in residence at the University and in consecutive, regular terms (other than the five-or six-week Summer Sessions).

Research under Personal Direction. A candidate for the Ph.D. degree who has demonstrated ability in graduate studies may, upon recommendation of his Special Committee and with the approval of the Dean, receive residence credit for research done during the summer under the personal direction of a member of the Faculty of the Graduate School. The privilege of working under Personal Direction will not ordinarily be granted to a student until he has completed at least a full year of graduate work in regular terms (other than the five-or six-week Summer Sessions). Application for the privilege must be accompanied by a statement of the member of the Faculty concerned showing the number of weeks during which he is prepared to supervise the work of the student and the nature of the research to be done. To obtain credit for such work, the student must register *in advance* at the office of the Graduate School, and the professor must certify to its satisfactory completion. A maximum of two terms may be earned in this way.

A candidate registered under Personal Direction during the sum-

[1]These rules apply to the Summer Session of five or six weeks. When a summer term is given, equivalent in length to one of the terms of the academic year, a graduate may receive a full term of residence credit.

mer may be admitted to the classes of the six-week Summer Session. Such students must register both in the Summer Session and in the Graduate School and must pay tuition at least equal to that required for the Summer Session.

Work in Absentia. A candidate for the Ph.D. degree may be credited with residence for work done away from the University, provided such an arrangement offers superior advantages for the prosecution of the student's work. Work *in absentia* is subject to the following conditions:

(a) An applicant for this privilege must be regularly registered in the Graduate School as a candidate for the doctorate, and while not in residence shall receive no compensation except from the University.

(b) He shall have spent at least two terms in Cornell University in study towards the doctor's degree.

(c) Permission to count such time as residence may be given by the Dean of the Graduate School for a period not to exceed one term, when the application is unanimously approved by the members of the student's Special Committee. When a longer period of outside study is required, application for an extension of time should be made to the General Committee, which may, at its discretion, extend the period to two terms. In no event, however, shall a student acquire a total of more than two terms' residence under these provisions.

(d) A student who avails himself of this privilege shall continue to work under the general direction of his Special Committee. Whenever possible, however, the work should be carried on under the immediate supervision of a competent director, acting for the Special Committee and to be designated by that Committee.

(e) Reports regarding the progress of the work shall be made as directed by the Special Committee at intervals not in excess of one month.

(f) In case a student desires to work *in absentia* during either or both of the last two terms of his residence, he must petition the General Committee for a waiver of the rule requiring him to spend these terms in residence at the University.

Major and Minor Subjects

A candidate for the Ph.D. degree must select a Major Subject and two Minor Subjects properly related to the Major Subject. He will devote more time to the Major Subject than to either Minor Subject, but the division of his time is left to the Special Committee. A list of approved Major and Minor Subjects will be found below, in the announcement of each department of instruction. The candidate should consult members of the Faculty regarding his choice of subjects. Work in Major and Minor Subjects consists of work in formal courses, informal work in seminars, assigned reading and independent study, in the discretion of the Special Committee. There are no requirements in semester hours for the Ph.D. degree.

Special Committees. After the candidate has chosen his Major and Minor Subjects, he must select a member[1] of the Faculty to represent each subject. The three persons so selected constitute the candidate's Special Committee, the representative of the Major Subject being

[1]In special cases two members of the Faculty may be chosen to represent either the Major or a Minor Subject. If the candidate chooses two members to represent the Major Subject, he may designate one of them as chairman.

chairman. Not later than two weeks after his first registration in the Graduate School a candidate must file, on the proper blank, a statement of the Major and Minor Subjects which he has selected. This statement must be signed by each member of the Special Committee as an indication of his approval and consent to serve on the committee.

A student may change the membership of his Special Committee with the approval of all the members of the newly constituted Committee. Notice of such change must be filed immediately with the Dean of the Graduate School. A vacancy on a Special Committee, caused by the absence of a member from the University, may be filled by the Dean on joint recommendation of the student and the members concerned.

Statement of Courses. At the beginning of each term a graduate student shall make out in duplicate a list of all the courses which he plans to take during the term and shall have this list signed by the chairman of his committee as an indication of approval. The chairman of the committee shall retain one copy; the duplicate copy shall be filed in the office of the Graduate School within two weeks after registration. Courses primarily for undergraduates, printed in italics, are ordinarily not open to graduate students.

Requirements in Foreign Languages

A candidate for the Ph.D. degree must demonstrate his ability to read both French and German (or two languages, other than English, approved by his Special Committee), by passing in each of these languages an examination given by a member of the Language Examination Board. The examiner is to be designated by the Dean of the Graduate School. The two languages so approved shall be significantly useful in the candidate's field of work and not chosen solely with reference to the preparation of the thesis.

A candidate for Ph.D. is expected to meet the foreign language requirements at the beginning of his candidacy at Cornell University for that degree. A minimum of seven terms of residence is required of a candidate who does not pass at least one language examination at this time. The extra term of residence may be waived by the General Committee of the Graduate School upon recommendation of the student's Special Committee, if preparation in foreign language is made during a period when the student is not receiving residence credit.

All examinations to test a candidate's knowledge of a foreign language must be passed at Cornell University before a member of the Language Examination Board. In case of failure in an examination, no re-examination can be given, ordinarily, within one month.

A minimum of three terms of residence is required after completion of all language requirements, except in the case of a student admitted to candidacy with two or more terms of residence credit; in such case, a minimum of two terms is required.

Language examinations passed within one month after registration are considered as being passed at the time of registration.

The Departments of Romance Languages and of German offer special courses for graduate students in beginning French and beginning German (see pages 59 and 55).

Thesis

A candidate for the Ph.D. degree is required to present a thesis. Ordinarily the thesis is written in the candidate's major field and under the direction of the chairman of his Special Committee. But with the approval of the representatives of the Major and Minor Subjects the candidate may elect to write the thesis under the direction of another member of the Faculty, who then becomes a member of the Special Committee.

The subject of the thesis, or essay, approved by the chairman of the candidate's Special Committee, must be filed with the Dean at least six months before the candidate intends to complete the requirements for the degree.

The thesis must be approved by all members of the Special Committee and must be acceptable in respect both of scholarship and of literary quality. The completed thesis should be in the hands of the Special Committee at least fifteen days before the final examination (Examination B or C; see page 27). During the five days immediately preceding this examination a typewritten copy, approved by all members of the Special Committee, shall be on file in the office of the Graduate School. Under no circumstances may either of these final examinations be given before the thesis has been accepted and filed.

The thesis must be typewritten, double spaced, on a durable rag bond, 8 x 10½ inches, with a left-hand margin of at least an inch and a quarter. The carbon copy need not be on bond paper. The title-page should be set up according to the following form:

[Title of Thesis]
A Thesis
Presented to the Faculty of the Graduate School of Cornell University for the degree of
[————————————]
By
[Author's Name in Full]
[Date on which degree is to be conferred.]

Immediately following the title-page there must be a biographical sketch of the author, in length not exceeding 150 words.

Before the degree can be conferred two[1] bound typewritten copies (one of which must be a ribbon copy) of the completed thesis, approved by the Special Committee, must be deposited in the office of

[1]The candidate should consult the chairman of his committee to ascertain if additional copies are required by the department.

the Graduate School. These copies become the property of the University Library.

Abstract of Thesis. A candidate for the Ph.D. degree must deposit in the office of the Graduate School an abstract of his thesis in two copies, typewritten, double spaced, on bond paper, 8 x 10½ inches. The abstract should be about 1500 words in length and should not exceed 1700 words. It must be approved by the Chairman of the Special Committee.

The candidate must pay to the Treasurer of the University a fee of $12.50 to cover the cost of publishing his abstract in an annual volume, "Abstracts of Theses." This volume will be available in March or April of the year following that in which the student receives his degree. A recipient of the degree who wishes to receive a copy of the volume containing the abstract of his thesis should file his name and address in the Office of the Graduate School. Off-prints of an abstract may be obtained by agreement with the contracting printer.

Examinations

Qualifying Examination. A candidate for the Ph.D. degree must pass a qualifying examination given by his Special Committee. The primary purposes of the qualifying examination are: (1) to ascertain whether the candidate is qualified to continue work for the doctorate; and, if so, (2) to aid in planning his work during the remainder of his candidacy. The examination is ordinarily given at the end of the first year of graduate study, if that year is at Cornell. If the candidate has had one year or more of graduate work elsewhere, the qualifying examination should be given as soon as possible after his entrance into the Graduate School. The qualifying examination may be oral or written or both.

Any member of the Special Committee may waive his part of the qualifying examination. The report on the qualifying examination shall, however, be made by the Special Committee as a whole, after consultation. If a candidate fails to pass the qualifying examination, no re-examination shall be allowed except on recommendation of the Special Committee.

A report on each qualifying examination, whether passed, waived, or failed, should be filed by the Special Committee in the office of the Graduate School.

Before presenting himself for Final Examination B or C (see next paragraph), a candidate must have earned at least two terms of residence credit after the passing or the waiving of the qualifying examination.

Final Examination. A candidate for the Ph.D. degree must pass a final examination, conducted by his Special Committee and covering (1) the Major and Minor Subjects and (2) the thesis and related topics. At the discretion of the Special Committee, the two parts of this examination may be given either separately or in combination.

When the two parts are given separately, an examination dealing mainly with the Major and Minor Subjects, designated as Final Examination A, may be given at the end of the fourth term of candidacy, or thereafter. Examination A will be both oral and written. The early completion of Examination A will leave the student free to devote his attention to the thesis and collateral studies during the remainder of his candidacy. Final Examination B, on the thesis and related topics and on such other work as the student may have done after completing Examination A, will be given after the residence requirement has been satisfied and the thesis has been completed and filed as provided on page 25. This examination may be oral, or both oral and written, at the discretion of the Special Committee.

When the two parts of the final examination are given in combination, the combined examination, designated as Final Examination C, will be given after the residence requirement has been satisfied and the thesis has been completed and filed, as provided on page 25. Examination C may be both oral and written.

No candidate may present himself for Final Examination B or C until he has satisfied the minimum period of residence and has filed the thesis as provided on page 25.

Applications for final examinations, (A, B, and C), approved by the Special Committee, must be filed in the office of the Graduate School at least five days in advance of the examination, except that candidates for May degrees must file applications not later than April 10.

Final examinations are conducted by the student's Special Committee and are open to all members of the Faculty. At the discretion of the Special Committee those under whom the student has worked may be invited to participate in the examination. But the Special Committee alone shall decide upon the merits of the candidate's performance.

A report on each final examination, whether passed or failed, shall be filed by the Special Committee in the office of the Graduate School. A candidate who has failed in any of these Final Examinations may not be re-examined within six months.

Final examinations must be completed within four years after the minimum residence requirement for the degree has been satisfied.

REQUIREMENTS FOR THE J.S.D. DEGREE

Work leading to this degree is designed to train legal scholars and to stimulate original investigation in the purpose, administration, history, and progress of the law.

Admission. To be eligible for admission to candidacy for J.S.D. the candidate shall have received the degree Bachelor of Laws from an approved law school; shall have had some professional practice or teaching experience after obtaining that degree; and must have shown a high level of professional ability.

Residence and Special Committee. The candidate shall be in resi-

dence a minimum period of two terms working under the direction of a Special Committee of three chosen by the candidate after consultation with the Chairman of the Division of Law. The chairman of the committee and one other member shall be from the Faculty of the Law School, but the third member may be chosen from the Graduate School Faculty in a field appropriate to the candidate's graduate objective, which normally will be in the related fields of Economics, Government, History, or Philosophy.

Program. The candidate shall pursue with distinction a program of study and investigation approved by his Special Committee and acceptable to the Division of Law and shall pass with superior standing such examinations as his Special Committee shall prescribe.

Thesis. The candidate must embody the results of his investigation in a thesis which shall be a creditable contribution to legal scholarship and which shall be presented in a form suitable for publication. He is required to file two bound copies, together with two copies of a typewritten abstract thereof, in the office of the Graduate School. For the procedures to be followed in presenting the thesis see page 25.

Final Examination. After the thesis has been completed and filed in the office of the Graduate School, as provided on page 25, the candidate is required to present himself for a final examination. A report on each final examination shall be filed by the Special Committee in the office of the Graduate School. A candidate who has failed in a final examination may not be re-examined within six months.

For further information concerning J.S.D. see page 188 of this *Announcement* and also the *Announcement of the Cornell Law School.*

TUITION AND OTHER FEES

GENERAL REGULATIONS

Tuition and other fees become due when the student registers. The University allows twenty days of grace in each term, five days in the five-and six-week Summer Sessions. The last day of grace is generally printed on the registration coupon which the student is required to present at the Treasurer's office. Any student who fails to pay his tuition charges, other fees, and other indebtedness to the University, or who, if entitled to free tuition, fails to claim it at the Treasurer's office and to pay his other fees within the prescribed period of grace, is thereby dropped from the University unless the Treasurer has granted him an extension of time to complete payment. The Treasurer is permitted to grant such an extension when, in his judgment, the circumstances of a particular case warrant his doing so. For any such extension the student is assessed a fee of $2. A reinstatement fee of $5 is assessed against any student who is permitted to continue or return to classes after being dropped from the University for default in payments. The assessment may be waived in any instance for reasons satisfactory to the Treasurer and the Registrar, when such reasons are set forth in a written statement.

Students registering at any time during the last ten weeks of either the first or the second term are required to pay tuition at the rate of ten per cent of the regular tuition of the term for each week or fraction of a week between the day of registration and the last examination day of the term. Students registering at any time during the last five weeks in the short summer courses are required to pay tuition at the rate of twenty per cent of the term's tuition for each week or fraction of a week between the day of registration and the last examination day of the term.

A tuition fee or other fee may be changed by the Trustees at any time without previous notice.

Fees Payable by Graduate Students

A Tuition Fee of $100 a term is to be paid by all students registered in the Graduate School. It is payable at the beginning of each term.

Certain classes of students are exempt from the payment of the tuition fee. They are:

1. Graduate students holding certain appointments as University Fellows or Graduate Scholars, and holders of certain temporary fellowships and scholarships.
2. Resident Doctors, upon recommendation of the Dean.
3. Graduate students who have satisfactorily completed the requirements of residence for the degree but who remain in residence while working on their theses or while doing other work in contemplation of a degree.
4. In addition to students exempt under the charter of the University from the payment of tuition the following, to the extent herein mentioned, shall also be exempt from such payments of fees:

Upon recommendation by the appropriate college dean and by action of the Board of Trustees, for each appointment, waiver of tuition in the Graduate School and of laboratory and shop fees in the department or line of work in which he is employed, may be made to a member of the teaching or scientific staff whose salary is below $1,500, subject to the following limitations:

(a) In the case of a candidate for a master's degree or a J.S.D. degree, up to a maximum of four academic terms only, any credits toward residence earned prior to appointment to be included in the four terms.

(b) In the case of a candidate for the Ph.D., until by work here or elsewhere he has completed the minimum residence credit of six terms required by the Graduate School, and for not to exceed two academic terms thereafter.

(c) Whenever waiver of tuition in the Graduate School is involved in the making of any given appointment, said appointment shall not carry a salary in excess of $1,400.

(d) The above regulations shall be applicable to new appointees whose appointments take effect July 1, 1934, or thereafter.

(e) Irrespective of salary received the former practice of including automatically a waiver of tuition with each appointment shall be continued in the case of any student who has held an appointment to the teaching or scientific staff previous to July 1, 1934, who is (1) a candidate for the master's degree, for a total of four terms, any waivers previous to July 1, 1934, included; (2) a candidate for the doctorate, for a period of two terms more than the minimum number of terms of residence at Cornell required to complete the residence requirement for the degree in question, any waivers previous to July 1, 1934, included.

A member of the teaching or scientific staff registered in the Graduate School whose salary equals or exceeds $1,500 shall pay tuition.

Members of the teaching or scientific staff taking work outside the department or line of work in which they are employed shall be charged tuition in proportion to the amount of work for which they are registered.

In the case of students drafted for service to the National Government at such times that they can receive no University credit for the term during which they are drafted, tuition may be refunded in full; and if they receive some credits during such term, their tuition may be refunded in proportion to the credits not received.

An Administration Fee of $12.50 a term, payable at the beginning of each term, is to be paid by all students registered in the Graduate School except Honorary Fellows and Resident Doctors.

A graduate student who returns to the University to present his thesis and to take the final examination for an advanced degree, all other work for that degree having been previously completed, shall register as a "candidate for degree only" and shall pay only an administration fee of $12.50.

A Matriculation Fee of $11 is required of every student upon his first entrance into the University. It must be paid at the time of registration and is not refundable.

A Health and Infirmary Fee[1] of $7.50 a term is required of all students (except Honorary Fellows, Resident Doctors, and students registered in the Medical College in New York City) at the beginning of each term. For a statement of the privileges given in return for this fee, see the *General Information Number*.

A Graduation Fee of $20 is required, at least ten days before the degree is to be conferred, of every candidate for an advanced degree. The fee will be returned if the degree is not conferred.

A Thesis Fee of $12.50 is required, at least ten days before the degree is to be conferred, of each candidate for the degree Doctor of Philosophy. This fee, the cost of publication in the volume "Abstracts of Theses," is in addition to the $20 graduation fee.

Laboratory Fees. Every person taking laboratory work in courses in which a fee is charged must pay to the Treasurer of the University the required fee or the required deposit for the materials *et cetera* that are to be used in the work.

A Willard Straight Hall Membership Fee[1] of $5 a term is required of all graduate students.

Fees for the Summer Session. Graduate students who attend classes in any of the summer sessions must register both in the Graduate

[1]Teachers and others not on the University teaching staff taking four hours of work or less, whose tuition payments have been regularly prorated, and who reside and regularly commute to the University from without the area of the city and town of Ithaca, shall be exempt from the payment of the Infirmary fee upon the understanding that if they should be admitted to the Infirmary they will pay the regular daily rate. To such students, membership in Willard Straight Hall is optional.

School and in the Summer Session. The following tuition fees must be paid by graduate students so registered:

For any session of either 5 or 6 weeks ..... $ 60.00
For a period of 11 weeks ..... $ 80.00
For a full term $100.00

A graduate student who is registered in both the Summer Session and the Graduate School must pay the following fees, which represent the combined Health and Infirmary fee and Willard Straight Hall membership fee:

For any session of either 5 or 6 weeks $4.50
For a period of 11 weeks $9.00

Please note that this paragraph refers only to fees for double registration in the Graduate School and the Summer Session.

Graduate students registering for the first time at Cornell must also pay the matriculation fee of $11. The usual laboratory fees and deposits and motor vehicle fees listed below are required.

Motor Vehicle Registration and Parking Fees. Any student, unless he has the rank of instructor in Cornell University, who owns, maintains, or for his own benefit operates, or has in charge a motor-driven vehicle in Tompkins County, the environment of Ithaca, is required each term to register the vehicle in person with the Campus Patrol and, unless it is owned by another member of his immediate family who is a resident of Tompkins County, to pay a registration fee of $1 a term. (However, no student is exempt from paying the registration fee if he gets a parking permit.) He must present (a) written consent of his parent or guardian if he is under 21 years of age, (b) evidence that the vehicle may be legally driven in New York State, (c) evidence that the operator may legally drive in New York State, and (d) evidence that the vehicle is effectively insured against public liability for personal injury and property damage for the standard minima of 5–10–5. (Exceptions are: (1) Summer Session students who have not been registered in the University during the past term and (2) special students who are registered for six hours or less a term.) This registration must be completed within the registration days at the beginning of the first term if the student is then subject to the rule. If he becomes subject to the rule after that time, he has one week in which to comply with it. Late registration of a vehicle makes the student liable to a penalty of $1.

Motorcycles must be registered but may not be used on the campus during class hours.

Parking on the campus by students during University hours is generally prohibited. Only in a special case may a student obtain a parking permit. The fee is $2 a term. The parking of *trailers* on any part of the University's grounds or outlying farms or other properties is prohibited.

The rules are the same during the Summer Session, but the only fee is $1 for a parking permit.

The student's registration in the University is held to constitute an agreement on his part that he will abide by its rules and regulations with regard to traffic and parking or suffer the penalty prescribed for any violation of them. All privileges under this head may be denied a student who is not in good standing.

Personal Direction. Students carrying on studies during the summer under Personal Direction are required to register with the Registrar as well as in the Graduate School.

Students registered under Personal Direction, if they desire residence credit for their work, must pay a tuition fee proportionate to the ratio which the credit desired bears to one entire term. Such students must pay the administration fee of $12.50, the Willard Straight Hall membership fee of $5, and the Health and Infirmary fee of $7.50; provided, however, that one half these fees will be remitted if the registration is for a period not exceeding 8 weeks. Such payment admits them to the current Summer Session classes without additional tuition payments, provided that the amount paid is at least equal to that charged students registered in the Summer Session. Students registered under Personal Direction during the summer, not for credit, are exempt from the payment of tuition, but may not attend either as visitors or for subsequent credit, any of the classes or exercises of the Summer Session.

The privilege of taking work under Personal Direction during the summer without the payment of tuition shall be restricted to *bona fide* candidates for degrees at Cornell University, who have been in residence during the preceding academic year.

FOREIGN STUDENTS

The University maintains on its staff a Counselor to Foreign students, Mr. Donald C. Kerr, whose duty is to look after the welfare of all students from other countries. He may be consulted on personal problems, social questions, or any other matter in which he may be helpful. His office is in the Cornell Cosmopolitan Club, 301 Bryant Avenue, which has living and dining room accommodations for a group of foreign and American students. It is suggested that all foreign students write him before coming to Ithaca, or call on him immediately upon arrival. He will be glad to meet them at the train, help them find suitable living quarters, either at the Club or elsewhere, and introduce them to other University officials and members of the faculty.

LIVING EXPENSES IN ITHACA

A few graduate student men live in the University Residential Halls. For information about these, address the Manager of Residential Halls, Morrill Hall. The majority of graduate students live in rooms or apartments which are for rent in the vicinity of the University. The lowest possible price is about $2.50 a week. The usual figure is probably about $3.50 to $4.50. About the middle of each

summer the University publishes a list of inspected rooms in which prices are quoted. For this list write to the Manager of Residential Halls.

The University offers no dining service in connection with its Residential Halls for Men. There are, however, two large cafeterias, the one at Willard Straight Hall and the other at the College of Home Economics. Near the Campus there are many restaurants which cater chiefly to students.

Because of the scarcity of self-supporting labor, new graduate students are advised not to register in the University unless they have sufficient funds for their expenses during the first year.

For Women. All women graduate students at Cornell University live in houses approved by the Counselor for women. Graduate women students who are under twenty-one years of age are required to live in the University Residential Halls. About the first of September the Office of the Counselor for women issues a list of rooms off the campus available for the fall term. This list may be had by writing to the Counselor for women who will give assistance in finding suitable rooms. For information regarding any possibilities of self help for women, inquiries should be addressed to the same office.

LOANS

The Graduate Student Loan Fund

Contributions from the alumni of Cornell University have made it possible to establish a Graduate Student Loan Fund for use of graduate students already enrolled at Cornell University.

Loan Funds for Women Graduate Students

There is available a loan fund for the use of women graduate students, provided by the Ithaca Branch of the Association of American University Women and Mu Chapter of Pi Lambda Theta. Applications should be made in writing to the Counselor for women.

A loan fund is available for the use of women graduate students in science, provided by Alpha Chapter of Sigma Delta Epsilon, Graduate Women's Scientific Fraternity. Applications should be made in writing to the Treasurer of Sigma Delta Epsilon, Martha Van Rensselaer Hall, Cornell University.

FELLOWSHIPS, SCHOLARSHIPS, PRIZES

Honorary Fellowships

Holders of the Doctor's degree, or other persons of recognized standing as scholars, who wish to continue work in a field in which they have already achieved distinction may, in the discretion of the Faculty, be appointed to honorary fellowships. These fellowships cover all fees except laboratory charges. Actual residence at the University and regular registration in the Graduate School are required of incumbents.

Award and Tenure

Appointments to fellowships and scholarships are made on April 1 of each year. Forms for making application may be had from the Office of the Graduate School. These applications, together with supporting documents, must be filed in the Office of the Graduate School on or before the first of March.

The Faculty may combine the stipends of two or more scholarships or fellowships or may divide a fellowship into two or more scholarships. Appointments are made for one academic year.

The holder of a fellowship or a scholarship may not accept another appointment, but must devote his whole time to his studies. He may, however, be called upon to assist in instruction up to a maximum of six clock-hours a week.

The stipends of fellowships and scholarships are payable at the office of the Treasurer of the University in eight equal installments, the first payment being due on October 15 and the other payments on the fifteenth of each month following.

Fellowships and Scholarships for 1943–44

The following fellowships and scholarships offered during the year 1943–44 carry exemption from tuition unless otherwise indicated:

Agriculture

Three *Henry Strong Denison Fellowships in Agriculture.* Stipends $1,000 each; no exemption from tuition. These fellowships are distributed annually among the following fields: plant sciences, animal sciences, social sciences, and agricultural engineering. Preference will be given to those applicants who expect to complete the requirements for the Ph.D. degree and who appear most promising from the standpoint of ability to conduct research.

The Clinton DeWitt Smith Fellowship in Agriculture. Stipend $400. This fellowship is limited to students who come from farm homes and who have had farm training. Applicants should submit detailed statements covering such experience.

The University Fellowship in Agriculture. Stipend $400.

See also under Animal Biology, Botany, and Entomology.

Animal Biology

The Simon Henry Gage Fellowship in Animal Biology. Stipend $500.

The Schuyler Fellowship in Animal Biology. Stipend $400.

The Graduate Scholarship in Animal Biology. Stipend $200.

See also under Agriculture and Entomology.

Architecture

The University Fellowship in Architecture, Landscape Architecture, Fine Arts, and Regional and City Planning. Stipend $400.

The Graduate Scholarship in Architecture, Landscape Architecture, Fine Arts, and Regional and City Planning. Free tuition only; no stipend.

Bacteriology

Applicants who wish to pursue work in Bacteriology should apply for either the fellowships in Agriculture or the scholarship in Veterinary Medicine.

Botany

The Goldwin Smith Fellowship in Botany, Geology, or Physical Geography. Stipend $400. Awarded for work in Geology in 1943–44.

The Graduate Scholarship in Botany, Geology, or Physical Geography. Stipend $200. Awarded for work in Botany in 1943–44.

See also under Agriculture.

Chemistry

These fellowships are ordinarily awarded for the last year of residence for the doctorate.

The Sage Fellowship in Chemistry. Stipend $600.

The du Pont Fellowship in Chemistry. Stipend $750.

The Carl G. Schluederberg Fellowship. Stipend $200.

The John E. Teeple Fellowship. Stipend $400.

Classics

Two *Fellowships in Greek and Latin.* Stipends $500 each.

These fellowships may be increased to three or more fellowships or scholarships with correspondingly reduced stipends.

One *Graduate Scholarship in Greek and Latin.* Stipend $200.

Economics

Cornell-Brookings Fellowship in Economics. Stipend $1,000. The Brookings Institution of Washington, D. C., and Cornell University are joint participants in offering this fellowship. It is awarded by the Graduate School of Cornell University to a graduate student previously in residence at Cornell. The fellow must be regularly registered in the Graduate School, but is in residence at the Brookings Institution.

The President White Fellowship in Political and Social Science.[1] Stipend $600. Awarded in alternate years in Government and Economics. Awarded in Economics in 1943–44.

The Fellowship in Political Economy. Stipend $600. Awarded in 1942–43 and alternate years.

Education

See Tuition Scholarships in Education below.

Engineering

Two or more of the following fellowships or scholarships may be combined if such combination be deemed desirable.

The McGraw Fellowship in Civil Engineering. Stipend $400.

The Graduate Scholarship in Civil Engineering. Stipend $200.

The Sibley Fellowship in Mechanical and Electrical Engineering. Stipend $400. (Ordinarily awarded for work in Mechanical Engineering.)

The Charles Bull Earle Memorial Fellowship in Mechanical and Electrical Engineering. Stipend $400. (Ordinarily awarded for work in Electrical Engineering.)

The Edgar J. Meyer Memorial Fellowship in Engineering Research. Stipend $400. (Ordinarily awarded for work in Mechanical Engineering.)

See also the John McMullen Graduate Scholarships and the Elon Huntington Hooker Fellowship in Hydraulics, listed below.

English

This fellowship is ordinarily awarded only to an applicant who has completed a year of graduate study.

The Cornell Fellowship in English. Stipend $600.

Entomology

See *The Comstock Scholarship in Entomology.* Stipend $150. See also under Agriculture and Animal Biology.

[1]Holders of the President White Fellowships in Modern History and in Political and Social Science may be called upon to be in attendance for a certain period each day in the President White Library, where they will ordinarily do a large part of their study.

Fine Arts

See Architecture.

Geology

The Goldwin Smith Fellowship in Botany, Geology, or Physical Geography. Stipend $400. Awarded for work in Geology or Physical Geography in 1943–44.

The Graduate Scholarship in Botany, Geology, or Physical Geography. Stipend $200. Awarded for work in Botany in 1943–44.

German

The University Fellowship in Germanic Languages. Stipend $400.

Government

The President White Fellowship in Political and Social Science.[1] Stipend $600. Awarded in alternate years in Government and Economics. Awarded in Economics in 1943–44.

History

These fellowships are ordinarily awarded only to applicants who have completed a year of graduate work or are able to submit written work of superior quality.

The President White Fellowship in Modern History.[1] Stipend $500. In the discretion of the Faculty this fellowship may be made a traveling fellowship, with a stipend of $700.

The Fellowship in American History. Stipend $400.

The George C. Boldt Fellowship in History. Stipend $1,000; no exemption from tuition.

The Graduate Scholarship in History. Stipend $200.

Home Economics

The Anna Cora Smith Fellowship in Home Economics. Stipend $400.

Landscape Architecture

See Architecture.

Mathematics

This fellowship is ordinarily awarded only to an applicant who has had a year or more of graduate study.

The Erastus Brooks Fellowship in Mathematics. Stipend $600.

Nature Study

The Comstock Scholarship in Nature Study. Stipend $150.

Philosophy

Three *Susan Linn Sage Fellowships in Philosophy.* Stipends $600 each. One or more of these fellowships may be divided to make two scholarships, stipends $300 each.

Physical Geography

See Geology.

Physics

The President White Fellowship in Physics. Stipend $600. The stipend of this Fellowship may, in the discretion of the Faculty, be reduced to $400 and the remaining $200 be assigned to a Graduate Scholarship.

See also Special Temporary Fellowships, page 39.

[1]Holders of the President White Fellowships in Modern History and in Political and Social Science may be called upon to be in attendance for a certain period each day in the President White Library, where they will ordinarily do a large part of their study.

Psychology

The Susan Linn Sage Fellowship in Psychology. Stipend $400.
The Susan Linn Sage Graduate Scholarship in Psychology. Stipend $200.

Regional and City Planning

See Architecture.

Romance Languages

This fellowship is ordinarily awarded only to an applicant who has had a year or more of graduate study.
The University Fellowship in Romance Languages. Stipend $400.

Veterinary Medicine

The Graduate Scholarship in Veterinary Medicine. Stipend $200.
Through accumulations it is sometimes possible to increase the amount available for this scholarship.

Tuition Scholarships

The Board of Trustees has established thirty tuition scholarships for graduate students. They entitle the holder to exemption from payment of tuition fees, but not other fees, for the duration of the appointment.

The holder of a tuition scholarship may not accept another appointment or be gainfully employed without permission from the General Committee of the Graduate School.

Comstock Scholarships

Under the terms of the will of the late Professor John Henry Comstock there have been established two graduate scholarships, each carrying a stipend of $150. These scholarships have, by vote of the Faculty of the Graduate School, been allocated to the fields of Entomology and Nature Study. Applications should be made not later than March 1 to the office of the Graduate School. These Scholarships carry free tuition.

Tuition Scholarships for Prospective Secondary School Teachers

Ten tuition scholarships are available for students in the fifth year of the five-year program, who give promise of becoming outstanding secondary school teachers. Five of these scholarships are available for students who have received their undergraduate training in institutions other than Cornell. Applications should be made to the Director of the School of Education before July 1.

Phi Kappa Phi Scholarship

The Phi Kappa Phi Scholarship, established by the Cornell Chapter of Phi Kappa Phi, is open to graduate students in any field of study. In awarding the scholarship preference is given to applicants

who are members of Phi Kappa Phi. The scholarship carries free tuition in the Graduate School and a stipend fixed yearly for each succeeding year by the Executive Committee of the Cornell Chapter of Phi Kappa Phi. For the year 1942–43 the stipend has been fixed at $150. Applications for this scholarship should be made on the regular application forms of the Graduate School and should be filed in the office of the Graduate School not later than March 1.

The John McMullen Graduate Scholarships

The John McMullen Graduate Scholarships are open to candidates for advanced degrees in Chemical, Civil, Electrical, or Mechanical Engineering. These scholarships were founded by a bequest of John McMullen, of Norwalk, Conn., to Cornell University "for the purpose of creating and maintaining free scholarship or scholarships for the education of young men as engineers, the details as to the amounts of said scholarships and the qualifications of the beneficiaries to be left to said institution to determine, said scholarships to be known as the John McMullen Scholarships." With the proceeds of this bequest the Board of Trustees has established fifteen scholarships of an annual value of $900. The scholarships have not been assigned to any particular School of the College, but will be awarded as conditions dictate. Each holder of one of these scholarships must register in the Graduate School and pay the appropriate tuition and fees. Applications should be addressed to the Graduate School.

The Elon Huntington Hooker Fellowship in Hydraulics

This fellowship was founded in 1919 by E. H. Hooker, a graduate of the School of Civil Engineering of the class of 1894, and is offered for research in experimental hydraulics in Europe or America. It is open to graduates of the School of Civil Engineering and similar schools of equivalent rank. The stipend of the fellowship is $510 without free tuition. Applications should be sent to the Graduate School.

The Eleanor Tatum Long Graduate Scholarship

The Eleanor Tatum Long Graduate Scholarship in Structural Geology is open to graduate students who are majoring in the branch of Geology named. Application for the scholarship should be made to the Department of Geology not later than March 1. The stipend is approximately $1,200 a year, and does not carry free tuition.

Charles Bean DeLong Graduate Research Fund

A fund of $6,000, the income from which is to be used at the discretion of the Department of Geology for the purpose of assisting male graduate students or assistants of the University who are majoring in and carrying out scientific research in economic or structural geology.

Special Temporary Fellowships

At the present time the following special fellowships also are awarded by the Faculty of the Graduate School:

The Allied Chemical and Dye Corporation Fellowship (Chemistry).
The American Nature Association Fellowship (Nature Study).
The American Potash Institute Fellowship (Vegetable Crops and Agronomy).
The Beacon Milling Company Fellowship (Animal Husbandry).
The Campbell Fellowship (Poultry Husbandry).
The Cerophyl Fellowship (Poultry Husbandry).
The Dairy Products Industrial Research Fellowship (Dairy Industry).
The Ethyl Gasoline Corporation Fellowship (Mechanical Engineering).
The Frosted Foods Fellowship Number 15 (Foods Chemistry).
The G. L. F. Cereal-breeding Fellowship (Plant Breeding).
The G. L. F. Dairy Cattle Fellowship (Animal Husbandry).
The G. L. F. Poultry Fellowship (Poultry Husbandry).
The Innis, Speiden and Company Fellowship (Plant Pathology and Entomology).
The Nassau County Farm Bureau Association Fellowship (Plant Pathology).
The New York Farmers Pasture Research Fellowship (Agronomy).
The New York Florists' Club Entomology Fellowship (Entomology).
The Nutrition Research Laboratories Fellowship (Veterinary Medicine).
The Southern Pine Chemical Gliddon Company Fellowship (Plant Pathology).
The Staten Island Growers' Fellowship (Plant Pathology and Entomology).
The Texas Gulf Sulphur Company Livestock Insect Fellowship (Entomology).
The Tobacco By-Products and Chemical Company Insecticide Fellowship (Entomology).
The Wallerstein Laboratories Juice Clarification Fellowship (Foods Chemistry).
The Western Condensing Company Fellowship (Poultry Husbandry).

For information regarding these special fellowships, address the department concerned.

The Graduate Prize in Philosophy

The Graduate Prize in Philosophy has an annual value of about twenty-five dollars and is open for competition to all students registered in the Graduate School of Cornell University.

The Prize will be awarded to the graduate student who submits the best paper embodying the results of research in the field of philosophy. The subject of the paper may be either historical or critical or constructive. It may be concerned either with problems of pure philosophy or with the philosophical bearing of the concepts and methods of the sciences.

Papers submitted in competition must be deposited in the office of the Dean of the Graduate School on or before the first of May. Each paper is to be typewritten and must bear a fictitious signature and be accompanied by the name of the writer in a sealed envelope.

The prize will be awarded by a committee appointed by the President of the University. A copy of the successful paper is to be deposited in the University Library.

THE UNIVERSITY LIBRARIES

Otto Kinkeldey, *Librarian;* E. R. B. Willis, *Associate Librarian;* Halldor Hermannsson, *Curator of the Icelandic Collection;* T. G. Bergin, *Curator of the Dante and Petrarch Collections;* Miss Gussie E. Gaskill, *Curator of the Wason Chinese Collection;* L. W. Morse, *Librarian of the Law Library;* W. W. Ellis, *Librarian of the Agricultural College Library;* Mrs. Dorothy Riddle, *Librarian of the College of Home Economics;* Miss E. C. Williams, *Librarian of the Veterinary College;* Robert P. Lang, *Librarian of the College of Architecture;* Dr. H. H. King, *Faculty Research Assistant.*

The University Libraries comprise the General Library of the University, the Seminary Libraries in the General Library Building,

the Architectural Library, the Chemical Library, the Sibley Engineering Library, the Civil Engineering Library, the Law Library, the Flower Veterinary Library, the Zoology Library, the Barnes Hall Library, the Goldwin Smith Hall Library, the Library of the New York State College of Agriculture, the Library of the New York State Agricultural Experiment Station at Geneva, and the Library of the College of Home Economics. The total number of bound volumes in them is now over one million. The number of periodicals, transactions, and other serials currently received is over five thousand; and, of many of these, complete sets are on the shelves.

In addition to the general store of books which a University Library of this size may be expected to contain, there are many special collections, assembled by scholars or with scholarly intent. Among the more noteworthy are:

THE PRESIDENT WHITE LIBRARY, received in 1891 as a gift from the first President of the University and largely increased by subsequent gifts and purchases. It includes special collections on the History of Superstition, the Age of the Reformation, and the French Revolution.

THE DANTE, PETRARCH, AND ICELANDIC COLLECTIONS, for which separate catalogues have been printed, were gathered by the first Librarian, Willard Fiske, who gave them to the University and bequeathed funds for their upkeep.

THE MAY COLLECTION relating to the history of slavery had as its nucleus the Library of the late Rev. Samuel J. May, long secretary of the American Anti-slavery Society.

THE WASON COLLECTION of books dealing with China and the Chinese was bequeathed to the Library by Charles William Wason, '76, with provision for its increase.

THE WORDSWORTH COLLECTION, formed by Cynthia Morgan St. John, presented to the University in 1925 by Mr. Victor Emanuel, '19, now includes more than 2,500 books by and about Wordsworth.

For the study of English, of the classical languages, of the Germanic and Romance languages, of philosophy, of politics and economics, of American and of European history, there have been provided in the library building seven seminary rooms, each equipped with a carefully chosen body of reference books, to which advanced students in these fields have access. In connection with the scientific and technical laboratories similar collections have been formed and well supplied with reference books, standard works, and sets of periodicals, conveniently arranged for study and research.

Cards of admission to the shelves in the stackrooms and to the White Historical Library will be issued to graduate students for the purpose of consultation and research. The privilege of taking books for home use is granted to all students who comply with the library regulations.

LECTURES IN BIBLIOGRAPHY. As a part of the work of the General Library, Mr. Willis, associate librarian, offers a series of informal talks to graduate students in the second term on the resources and facilities of the Library and on the employment as aids to research of the general bibliographical helps.

FIELDS OF INSTRUCTION

The several fields of instruction of the Graduate School are described in the pages that follow hereafter.

ARRANGEMENT OF SUBJECTS. Subjects are grouped in broad fields as follows, and in the following order:

Architecture and the Fine Arts.
Languages and Literatures.
Philosophy.
History and the Social Sciences.
Animal Sciences.
Plant Sciences.
Physical Sciences.
Agriculture.
Education.
Engineering.
Home Economics.
Hotel Administration.
Law.
Veterinary Medicine.
The Medical Sciences as presented in the Medical College, New York City.
The Agricultural Sciences as presented in the New York State Experiment Station at Geneva.

APPROVED MAJOR AND MINOR SUBJECTS. For each field there is given an approved list of titles from which candidates for advanced degrees choose major and minor subjects. The numerals 1, 2, 3, 4 have the following meaning:

1, approved as major subject for the Ph.D.
2, approved as major subject for the master's degree.
3, approved as minor subject when the major is in the same field.
4, approved as minor subject when the major is in another field.

UNDERGRADUATE AND GRADUATE COURSES. In this announcement courses intended primarily for graduate students but open also to advanced undergraduates are titled in **bold face** type. Courses intended primarily for undergraduates but often meeting needs of graduates are titled in *italic* type, and are given in skeleton outline only. For details about these courses, see the respective college announcements.

ARCHITECTURE AND FINE ARTS

The Faculty of the Graduate School by its action of January 27, 1933, created the Division of Architecture and Fine Arts for the more effective administration of the work leading to the professional degrees of Master of Architecture, Master of Landscape Architecture, Master of Fine Arts, and Master in Regional Planning. Those primarily concerned with these professional degrees are the Professors and Assistant Professors of Architecture, of Lansdcape Architecture, of Painting and Sculpture, of Regional and City Planning, of Music, of Poetry, of Drama, and of Aesthetics.

Courses under the jurisdiction of the Division of Fine Arts are available to candidates for advanced degrees other than those mentioned above, subject to such conditions as may be imposed by the student's Special Committee.

Approved Major and Minor Subjects (key to symbols on p. 41)

(The combination of subjects chosen must be approved by the professors in the student's major field. Certain subjects outside the field of Fine Arts may be chosen for a minor with the approval of the professors concerned.)

Aesthetics 2, 3, 4
Architectural Construction 2, 3, 4
Architectural Design 2, 3, 4
Composition Relative to Pictorial and Decorative Art 2, 3, 4
Dramatic Production 2, 3, 4
Dramatic Technique 2, 3, 4
Drawing 2, 3, 4
History of Architecture 1, 2, 3, 4
History of Landscape Architecture 2, 3, 4
History of Music 2, 3, 4
History of Painting 2, 3, 4
History of Painting and Sculpture 1, 2
History of Sculpture 2, 3, 4
Landscape Design 2, 3, 4
Modeling 2, 3, 4
Musical Composition 2, 3, 4
Musicology 1, 2, 3, 4
Painting 2, 3, 4
Planting Design 2, 3, 4
Playwriting 2, 3, 4
Poetry 2, 3, 4
Regional and City Planning 2, 3, 4
Sculpture 2, 3, 4
Theory of Music 2, 3, 4

AESTHETICS

Professors R. M. OGDEN and R. W. CHURCH.

The courses in Aesthetics offered by the Sage School of Philosophy are:

Philosophy 8a. *Aesthetics*: *Psychology of Art.* First term. Three hours a week. Professor OGDEN. T Th S 11. Museum of Casts.

[**Philosophy 8b.** *Aesthetics*: Philosophy of Art. Second term. Three hours a week. Associate Professor CHURCH. T Th S 11. Goldwin Smith 128. Not given in 1942–43.]

[**Philosophy 19.** Advanced readings in Aesthetics. First and second terms. Associate Professor CHURCH. Hours by appointment. Not given in 1942–43.]

Readings to be selected in accordance with the interests and preparation of the student.

[**Philosophy 45.** Seminar in Aesthetics. Second term. Associate Professor CHURCH. Hours to be arranged. Goldwin Smith 220. Not given in 1942–43.]

Expression and perception in Aesthetics.

ARCHITECTURE

Professors H. E. BAXTER, L. P. BURNHAM, G. D. CLARKE, A. H. DETWEILER, A. D. SEYMOUR, J. N. TILTON, JR., GEORGE YOUNG, JR., J. A. HARTELL, and P. A. UNDERWOOD.

Graduate work is offered in architectural design, in the history of architecture, in advanced construction, and in regional and city planning.

Candidates for the degree of Master of Architecture must have had preliminary training in the subjects elected for graduate work equivalent to that required in like subjects in this University for the degree of Bachelor of Architecture.

The facilities for graduate work in architecture are excellent. Large well-lighted drafting-rooms and studios are provided and a special architectural library, comprising several thousand books, photographs, lantern slides, and numerous original drawings, is situated in White Hall where it is easily accessible to the student.

Instruction is given by means of lectures, seminar discussions, and especially by direct personal criticism and advice.

Architectural Design. Professors BURNHAM, SEYMOUR, and HARTELL.

History of Architecture. Professors DETWEILER and UNDERWOOD.

Architectural Construction. Professors BAXTER, TILTON, and YOUNG.

REGIONAL AND CITY PLANNING

Professors G. D. CLARKE and T. W. MACKESEY, and other members of the University Faculty.

Graduate work is offered in regional and city planning leading to the degree, Master in Regional Planning. The purpose of graduate work in regional and city planning is to offer to adequately trained students facilities for advanced study and research, with the twofold purpose of providing each student with a comprehensive view of the field of planning and of training him for independent investigation in that field. Students may approach advanced work in planning from a background of study in any one of a number of related fields including architecture, landscape architecture, engineering, government, geography, sociology, economics, or agriculture. Each graduate student follows a plan of study drawn up in consultation with a Faculty Committee. That plan of study is based on the individual student's background and interests.

710. **Principles of Regional and City Planning.** First term. Credit three hours. M W F 12.

711. **City Planning Practice.** Second term. Credit three hours. Prerequisite, Course 710. Professors CLARKE and MACKESEY. M W F 12. White 201.

The procedures and techniques of gathering and analyzing data for municipal planning studies; the selection and integration of data for use in planning; practical application of the theories of city planning; office practice. Lectures assigned reading, reports.

712. **Regional Planning Practice.** Second term. Credit three hours. Prerequisite, Course 710. Open to graduates and upperclassmen in all colleges of the University. Professors CLARKE and MACKESEY. Hours to be arranged.

A study of the principles involved in county, regional, state, and national planning. Includes discussion of following factors involved: land use, water resources, recreation, transportation, public services, and public works. Lectures, assigned reading, reports, and examinations. Occasional lectures may be given by members of other faculties and outside lecturers.

713. **Housing.** First term. Credit two hours. Registration limited. Prerequisite, Course 710. Professors CLARKE and MACKESEY. M 2–4. White.

An introduction to the theory and standards of housing practice through analysis and comparison of various existing examples, considering the social, economic, and technical sides of the work. Lectures, assigned reading, and reports.

714. **Seminar in Regional and City Planning.** Throughout the year. Credit one hour each term.

715. **Seminar in Park Planning.** First term. Credit two hours. Registration limited. Professor CLARKE. T 8–10. White B 15.

Specific problems relating to the design of city, state, and national parks, with a study of examples.

716. **Seminar in Parkway, Freeway, and Highway Planning.** Second term. Credit two hours. Professor CLARKE. T 8–10. White B 6.

717. **Zoning Principles and Practice.** Second term. Credit two hours. Prerequisite, Course 710. Professor MACKESEY. M 2–4. White.

Technical and legal aspects of drafting and administering zoning regulations.

THE HISTORY AND PRACTICE OF THE FINE ARTS

Professors D. L. FINLAYSON, A. H. DETWEILER, J. A. HARTELL, J. O. MAHONEY, CHRISTIAN MIDJO, W. K. STONE, F. O. WAAGÉ, K. L. WASHBURN, and P. A. UNDERWOOD.

Graduate work is offered in historical, theoretical, or creative work in the field of the fine arts.

Candidates for the degree of Master of Fine Arts must be holders of a baccalaureate degree. A special six-year course leads to the two degrees A.B. and M.F.A.

Drawing and Painting. Professors MAHONEY, MIDJO, STONE, and WASHBURN.

Composition. Professors MAHONEY, MIDJO, STONE, and WASHBURN.

Sculpture. Professor WASHBURN.

History of Art. Professors FINLAYSON and WAAGÉ.

History of Architecture. Professors DETWEILER and UNDERWOOD.

Other members of the staff will cooperate as necessary.

LANDSCAPE ARCHITECTURE

Professors G. D. CLARKE, R. W. CURTIS, E. D. MONTILLON, EDWARD LAWSON, and members of the Faculty in Architecture.

Graduate work in Landscape Architecture is offered in design, history, and planting design.

Candidates for the degree of Master of Landscape Architecture must have had preliminary training in the subjects elected for graduate work equivalent to that required in like subjects in this University for the degree of Bachelor of Landscape Architecture.

Landscape Design. Professors CLARKE, MONTILLON, and LAWSON.

History of Landscape Architecture. Professors MONTILLON and LAWSON.

Planting Design. Professors CURTIS and LAWSON.

Park and Parkway Design. Professor CLARKE.

MUSIC

Professors PAUL J. WEAVER and OTTO KINKELDEY; EGON PETRI, *Pianist in Residence;* ROY HARRIS, *Composer in Residence; Acting Associate Professor* JOHN M. KUYPERS; *Assistant Professors* RONALD INGALLS and RICHARD T. GORE; ERIC DUDLEY, JOHANA HARRIS, ROBERT HULL, and WENDELL MARGRAVE.

MUSIC THEORY

1. *Theory I.* Mr. GORE. Throughout the year. Three hours a week.

101. *Theory II.* Mr. GORE. Throughout the year. Three hours a week.

[201. *Theory IIIa.* Throughout the year. Two hours a week. Not given in 1942–43.]

[203. **Theory IIIc.** Throughout the year. Credit two hours a term. Not given in 1942–43.]

303. **Theory IVc.** Throughout the year. Credit two hours a term. Prerequisite, Music 203 or its equivalent. Dr. HARRIS. Hours to be arranged. 320 Wait Avenue.

This course is designed to develop facility in the hearing, reading and writing of florid, fugal, and polychordal counterpoint. Emphasis will be placed on creative work.

305. **Theory IVe.** Throughout the year. Credit two hours a term. Prerequisites, Music 201 or 203 or their equivalent. Dr. HARRIS. Hours to be arranged. 320 Wait Avenue.

This course is designed as a study of form and analysis and as a survey of materials. Ten major works, chosen from chamber music, choral, orchestral, band, and operatic literature, will be discussed, analyzed, and reported on in essays of musical criticism. Score reading will be emphasized.

MUSIC APPRECIATION

11. *The Art of Music.* Professor WEAVER and Mr. HULL. Throughout the year. Three hours a week.

13. *The Orchestra.* Mr. HULL. Each term. Two hours a week.

15. *Instrumental Ensemble.* Acting Associate Professor KUYPERS. Throughout the year. Three hours a week.

18. *Vocal Ensemble.* Acting Associate Professor KUYPERS. Throughout the year. Three hours a week.

MUSIC HISTORY

21. *History of Music.* Professor WEAVER and Mr. HULL. Throughout the year. Two hours a week.

[121. *The Opera.* Not given in 1942–43.]

[122. *Organ Music.* Not given in 1942–43.]

[123. *Orchestral Music.* Not given in 1942–43.]

[124. *Chamber Music.* Not given in 1942–43.]

125. *Piano Music.* Assistant Professor GORE. Second term. Three hours a week.

126. *Choral Music.* Assistant Professor GORE. First term. Three hours a week.

[127. *Violin Music.* Not given in 1942–43.]

[221. **Bach.** Not given in 1942–43.]

[222. **Haydn and Mozart.** Not given in 1942–43.]

223. **Beethoven.** First term. Credit two hours. Professor WEAVER. W 4–6. 320 Wait Avenue.

A study of the life and works of Beethoven.

[224. **Brahms.** Not given in 1942–43.]

[225. **Wagner.** Not given in 1942–43.]

[226. **Debussy.** Not given in 1942–43.]

228. **Modern European Composers.** Second term. Credit two hours. Professor WEAVER. T Th 9. 320 Wait Avenue.

A study of the lives, works, and idioms of important modern, and especially current, European composers.

[229. **Modern American Composers.** Not given in 1942–43.]

APPLIED MUSIC

401. *First Year.* Individual instruction in piano, organ, voice, violin, viola, cello, string bass, and wind, brass, and percussion instruments. JOHANA HARRIS, Assistant Professor GORE, Mr. DUDLEY, Mr. HULL and Mr. MARGRAVE. Students who are interested should consult Professor WEAVER.

402. *Second Year.* A continuation of Music 401.

451. *Piano Master Class.* Dr. PETRI. Students who are interested should consult Professor WEAVER.

COURSES FOR GRADUATES

501. **Seminar in Composition.** Throughout the year. Credit two hours a term. Hours to be arranged. Dr. HARRIS.

A limited number of graduate students (and by permission seniors) will be admitted to this course, who have (1) facility in the hearing, reading and writing of melody, harmony, and counterpoint; (2) a working knowledge of the soprano, alto, tenor, and bass clefs; and (3) facility in score reading.

The work is intended to make the student acquainted with compositional practices in various styles, and to develop the student's creative abilities.

521. **Seminar in Musicology.** Throughout the year. Credit two hours a term. Hours to be arranged. Professor KINKELDEY.

This course is primarily for graduates who have the requisite reading knowledge of one or more of the important foreign languages, a fair knowledge of music theory, and some skill in applied music.

The work is intended to make the student acquainted with the accomplishments of the past and with modern methods and aims in all fields, scientific, aesthetic, and historical, of musical research and investigation. Special topics or fields of study will be selected each term after consultation with the class.

DRAMA AND THE THEATRE

Professors A. M. DRUMMOND, W. H. STAINTON, EDWIN NUNGEZER, JOHN C. ADAMS, H. A. MYERS, and H. D. ALBRIGHT.

The degree of Master of Fine Arts in Drama and Dramatic Production will be granted to candidates of special aptitude in the practical phases of Dramatic Production or Playwriting. Their program must include suitable studies in related Fine Arts; two years of residence will normally be required, with approximately one-half the program of study in applied projects in stage presentation; a major practical project in the second year will be the thesis.

THE CORNELL UNIVERSITY THEATRE provides, in its *Laboratory Theatre* division, for public presentations of the work of graduate students in Dramatic Interpretation and Acting; in its *Studio Theatre* productions, for presentation of the work in Playwriting; and in the *Summer Theatre*, an opportunity for intensive work in all phases of theatre practice. *Director of the University Theatre*, A. M. DRUMMOND; *Assistant Director*, W. H. STAINTON; *Company Director*, H. D. ALBRIGHT; *Technical Director*, JOEL TRAPIDO; *Costumes*, ELIZABETH D. WORMAN.

Modern Drama. (*English* 48.)

Shakespeare. (*English* 61.)

Dramatic Structure. Associate Professor MYERS. (*English* 150 and 250.)

Elizabethan Dramatic Production. Assistant Professor ADAMS. (*English* 151.)

Dramatic Production. Associate Professor STAINTON. (*Speech and Drama* 41, first term, M W F 11.)

Advanced Dramatic Interpretation and Acting. Professor DRUMMOND. (*Speech and Drama* 42. Throughout the year. W 2–4.)

Stagecraft and Design. Associate Professor STAINTON. (*Speech and Drama* 45, second term, M W 11, T 1:40–4).

Stage Lighting. Associate Professor STAINTON. (*Speech and Drama* 45a, first term, T 1:40–4 or as arranged.)

[*History of Theatrical Costume.* Miss WORMAN. (*Speech and Drama* 47). Not given in 1942–43.]

History of the Theatre. Professor DRUMMOND. (*Speech and Drama* 48, second term, T Th S 11.)

Playwriting. Professor DRUMMOND. (*Speech and Drama* 49b.)

Dramatic Production; in relation to aesthetic principles. Professor DRUMMOND (*Speech and Drama* 66, first term, Th 2–4.)

Dramatic Art. Professor DRUMMOND. (*Speech and Drama* 67. Throughout the year, hours to be arranged.)

Modern Theories of Stage Presentation. Associate Professor STAINTON. (*Speech and Drama* 68. Hours to be arranged.)

Theatre Practice. Professor DRUMMOND or Associate Professor STAINTON. (*Public Speaking* 91. Correlated with the work of The University Theatre. Throughout the year and Summer Session. Hours to be arranged.)

POETRY

Professors L. N. BROUGHTON, R. C. BALD, E. K. BROWN, H. W. THOMPSON, LANE COOPER, W. H. FRENCH, EDWIN NUNGEZER, J. C. ADAMS, C. W. JONES, W. M. SALE, and E. C. WILSON.

See also courses described under English Language and Literature, p. 51.

31. *Medieval Literature.* Throughout the year. Three hours a week.
33. *The English Renaissance.* Throughout the year. Three hours a week.
34a. *Eighteenth Century Literature.* Second term. Three hours a week.
35. *The Romantic Revival.* Throughout the year. Three hours a week.
39. *American Literature.* Throughout the year. Three hours a week.
53. *Modern Poetry.* Second term. Three hours a week.
60. *Chaucer and his Age.* Throughout the year. Three hours a week.
61. *Shakespeare.* Throughout the year. Three hours a week.
63. *Milton.* Second term. Three hours a week.
70. *Wordsworth.* Second term. Three hours a week.
71. *Coleridge and Keats.* First term. Three hours a week.
72. *Byron and Shelley.* Throughout the year. Three hours a week.
79. *T. S. Eliot.* First term. Three hours a week.

104. **Principles of Literary Criticism.** Throughout the year. Professor COOPER. W 11–12:50. Goldwin Smith 127.
A study of the chief theories of poetry, and chief kinds of literature, with illustrations drawn from writers both ancient and modern.

106. **Dante in English.** Throughout the year. Professor COOPER. M 11–12:50 Goldwin Smith 127.

108. **Elizabethan Non-dramatic Literature.** Throughout the year. Associate Professor NUNGEZER. W 3–5:30. Goldwin Smith 245.

[109. **Shakespeare.** Throughout the year. Professor BALD. Room and hour to be arranged. Not given in 1942–43.]

110. **Studies in Seventeenth Century Literature.** Throughout the year. Professor BALD. Room and hour to be arranged.

[111. **Spenser.** Second term. Assistant Professor WILSON. Not given in 1942–43.]

112. **Scottish Literature.** Throughout the year. Professor THOMPSON. Room and hour to be arranged.

114. **Eighteenth Century Literature.** Throughout the year. Associate Professor SALE. Room and hour to be arranged.

116. **Wordsworth and His Contemporaries.** Throughout the year. Professor BROUGHTON. M 4–6. Goldwin Smith 338.
First term: a detailed study of the works of Wordsworth and their influence on contemporary English thought and literature. Second term: the contemporaries of Wordsworth.

130. **Studies in the Romantic Movement.** Throughout the year. Assistant Professor WILSON. Room and hour to be arranged.

135. **Studies in Victorian Literature.** Throughout the year. Professor BROWN. Th 4–6.

[142. **Theories of Criticism.** Throughout the year. Associate Professor SALE. Not given in 1942–43.]

LANGUAGES AND LITERATURES

THE CLASSICS

Professors H. L. JONES, HARRY CAPLAN, JAMES HUTTON, F. O. WAAGÉ, FRIEDRICH SOLMSEN, and Dr. R. L. WARD.

Approved Major and Minor Subjects (key to symbols on p. 41)

Latin Language and Literature 1, 2
Latin Literature 2, 3, 4
Latin Language 3, 4
Vulgar Latin 3, 4
Mediaeval Latin Literature 3, 4
Classical Rhetoric (in translation) 3, 4
Greek Language and Literature 1, 2
Greek Literature 2, 3, 4
Greek Language 3, 4
Comparative Indo-European Linguistics 1, 3, 4
Classical Archaeology 1, 2, 3, 4
Greek Archaeology 2, 3, 4
Roman Archaeology 2, 3, 4

Admission to graduate study in a subject included in the group of the Classics, except in Archaeology, assumes a knowledge of the field selected equivalent in general to that expected of a student who has pursued the subject concerned throughout four years of undergraduate study in a college of recognized standing.

Graduate work in the Classics is conducted in the main by the seminary system, the object of which is training in the methods, the principles, and the performance of independent research and criticism, and the work is therefore as far as possible put into the hands of the students themselves. Subjects other than those investigated in one of the seminaries of the year are ordinarily presented by courses of lectures.

Two seminary rooms in the Library Building are reserved for the exclusive use of graduate students in the Classics. In addition to the various complete sets of philological and of archaeological journals and standard works of reference in these rooms, the general University Library is at the disposal of the graduate students; stack permits are available when required, and special collections of books can be transferred from the general library to the seminary rooms when needed.

Two fellowships in Greek and Latin in the value of $500 and tuition and one scholarship of $200 and tuition are awarded annually.

The income of the Charles Edwin Bennett Fund for Research in the Classical Languages is used each year in the way best suited to promote the object for which the fund was established.

Doctoral dissertations of an appropriate nature will be accepted for publication in the *Cornell Studies in Classical Philology.*

GREEK

1a. *Greek for Beginners.* Introduction to Homer's Iliad. Both terms. Three hours a week.

1b. *Homer's Iliad.* Continuation of Greek 1a. Both terms. Three hours a week.

2a. *Attic Greek. Plato, Selected Dialogues.* Both terms. Three hours a week.

2b. *Euripides, Iphigenia in Tauris* and *Alcestis*; *New Testament, Selections.* Both terms. Three hours a week.

5. *Greek Composition.* Throughout the year. One hour a week.

[7. *Greek Myths.* Illustrated lectures. First term. Two hours a week. Not given in 1942–43.]

[8. *Illustrated Lectures on Ancient Greece and Greek Life.* Second term. Two hours a week. Not given in 1942–43.]

17. **Aristophanes, Clouds; Sophocles, Oedipus Rex, Antigone; Herodotus.** Throughout the year. Prerequisite, Greek 2b. Professor JONES. T Th S 11. Goldwin Smith 120.

20. **Lyric Poetry; Aeschylus, Prometheus Vinctus; Theocritus; Demosthenes, Philippics.** Throughout the year. Prerequisite, Greek 17. Professor JONES. T Th S 9. Goldwin Smith 120.

22. **Plato, the Republic; Pindar, Selected Odes; Thucydides.** Throughout the year. Prerequisite, Greek 20. First term, Professor HUTTON; second term, Assistant Professor SOLMSEN. T Th S 11. Goldwin Smith 128.

25. **Advanced Greek Composition.** Throughout the year. Prerequisite, Greek 5. Professor JONES. Th 2. Goldwin Smith 124.

30. **Lectures: The History of Greek Literature.** Throughout the year. Assistant Professor SOLMSEN. T Th 10. Goldwin Smith 124.

[33. **Seminary. Studies in Greek and Roman Rhetoric and Oratory.** Professor CAPLAN. Not given in 1942–43.]

[39. **Seminary. Aeschylus.** Professor HUTTON. Not given in 1942–43.]

[41. **Seminary Strabo; or Homeric Geography.** Professor JONES. Not given in 1942–43.]

[42. **Seminary. Plato.** Assistant Professor SOLMSEN. Not given in 1942–43.]

52. **Greek Dialects.** Second term. Dr. WARD. T Th 9. Goldwin Smith 124.

See also readings in GREEK PHILOSOPHY (under PHILOSOPHY), INDO-EUROPEAN PHILOLOGY (under LATIN), METHODS OF LITERARY AND LINGUISTIC STUDY, AND PRINCIPLES OF LITERARY CRITICISM (under COMPARATIVE STUDY OF LITERATURE), and ANCIENT HISTORY (under HISTORY).

ARCHAEOLOGY AND ANCIENT ART

Associate Professor WAAGÉ.

1. *History of Painting and Sculpture: Ancient and Mediaeval.* First term. Three hours a week.

2. *History of Greek Sculpture.* First term. Three hours a week.

3. *Art of the Roman Empire.* Second term. Three hours a week.

4. *Ancient Art.* Second term. Three hours a week.

[5. *Ancient Painting and Mosaic.* Second term. Three hours a week. Not given in 1942–43.]

6. *History of Coins.* First term. Two or three hours a week.

101. **Pausanias and the Topography of Greece with Special Reference to Athens.** Hours to be arranged. Goldwin Smith 35.

102. **Problems in Classical Archaeology.** Hours to be arranged. Goldwin Smith 35.

LATIN

1a. *Freshman Course: For Students Offering Three Units of Entrance Latin.* Ovid; Virgil; Horace, Odes and Epodes. Both terms. Three hours a week.

1. *Freshman Course: For Students Offering Four Units of Entrance Latin.* Cicero, De Senectute; Martial, Epigrams; Horace, Odes and Epodes. Both terms Three hours a week.

2. *Sight Translation.* Throughout the year. One hour a week.

8. *Terence; Catullus; Horace, Satires and Epistles; Tacitus, Agricola; Livy; Seneca, Epistles.* Throughout the year. Three hours a week.

11. *Ovid.* First term. Two hours a week.

16. **The Greater Republican Writers.** Plautus; Cicero; Lucretius. Throughout the year. Professor HUTTON. M W F 9. Goldwin Smith 124.

[17. **Literature and History of the Early Empire.** Tacitus, Annals; Juvenal; Pliny's Letters; Seneca's Letters. Throughout the year. Not given in 1942–43.]

21. *Latin Writing.* Throughout the year. One hour a week.

26. **Course for Teachers.** Second term. Professor CAPLAN. T Th 12. Goldwin Smith 124.

[27. *Topography and Architectural Remains of Rome.* Not given in 1942–43.]

41. **Seminary. Horace.** Throughout the year. Professor CAPLAN. T 2. Library, Classical Seminary Room.

45. **Latin Writing, Advanced Course.** Throughout the year. First term. Assistant Professor SOLMSEN; second term, Dr. WARD. M 2. Goldwin Smith 124.

[47. **History of the Latin Language.** Not given in 1942–43.]

[48. **Vulgar Latin: Petronius, Cena Trimalchionis; Vulgar Latin Inscriptions Including Christian Inscriptions.** Not given in 1942–43.]

[49. **Comparative Grammar of Greek and Latin:** Introduction to Indo-European Linguistics. Not given in 1942–43.]

[50. **Latin Epigraphy.** Two hours. Not given in 1942–43.]

51. **Italic Dialects: Oscan and Umbrian.** First term. Dr. WARD. T Th 9. Goldwin Smith 124.

COMPARATIVE STUDY OF LITERATURE

Professor LANE COOPER (*Professor of the English Language and Literature*) and *Professor* JAMES HUTTON (*Professor of the Classics*).

Approved Major and Minor Subjects (key to symbols on p. 41)

Dante 1, 2, 3, 4
English Language and Literature 1, 2, 4
Literary Criticism 1, 2, 3, 4
Old and Middle English 1, 2, 3, 4
Writers on Art 2, 3, 4

Once the usual demands for entrance into the Graduate School are satisfied, no particular requirement but special fitness is made of candidates for advanced degrees who desire entrance into this field of work, which is closely related to English Philology in the broad sense of the term. Philology is here taken to mean the conjoint study of language and literature. The candidate must evince some special fitness for either the literary or the linguistic side of the work, but in any case must not be deficient in literary appreciation. He will have opportunity to prove his worth in the first year of graduate study. In general, one year of satisfactory graduate work is enough for the degree of Master of Arts. Students who are permitted to advance toward the doctoral degree commonly expect to receive it after two years more—but the attainment of the doctorate in three years must not be regarded as a fixed rule. The work for both degrees will be adapted to the needs and purposes of the individual candidate; great care will be taken to find a suitable subject for the "thesis." The work is in the main designed to develop good scholars and effective teachers for colleges and universities.

Apart from a broad culture, however attained, the best foundation for this work is undergraduate study of the Classics. Those who wish to be candidates should use every opportunity to improve their acquaintance with Greek and Latin literature, whether in the original or through translations, and with mediaeval literature —for example, in Old and Middle English, which had best be begun before the first year of graduate work. The graduate student must bring a love of good literature with him, and not expect to acquire it at a late date, for his special studies now presuppose that love. In general, a good candidate is one who has been drawn to read the best books, and has read them, from the age of eight or ten years on, and who has had a broad and sound course of study as an undergraduate. This course should have included one satisfactory year of French, at least two years of German, and a fair amount of Latin. For those who have not had Greek in the preparatory school, it is desirable to begin it as early as the Sophomore year in college; but it may be begun later; and candidates who have not studied the Greek language will not be rejected on that account. A student who has had a broad general culture, and has done very well in Classics, history,

biology, or mathematics, may expect to succeed in the comparative study of literature.

Good doctoral dissertations will be accepted for publication in the *Cornell Studies in English*.

27. *Modern Writers on Art.* Throughout the year. Three hours a term.

28. *English Translations of Greek and Latin Classics.* Throughout the year. Three hours a term.

105. *General Reading.* First term. Three hours.

[103 a. **Old English.** First term. Professor COOPER. Given in alternate years, not in 1942–43.]

103 b. **Middle English.** Second term. Professor COOPER. M W F 10. Goldwin Smith 127.

A study of the foundations of the English language and literature, with emphasis upon the chief writers of the fourteenth century, especially Chaucer, and upon their relations to Blake, Wordsworth, Kipling, and others. Some attention is paid to literary species, and to earlier and later translations of the Bible.

104. **Principles of Literary Criticism.** Throughout the year. Professor COOPER. W 11–12:50. Goldwin Smith 127.

A study of the chief theories of poetry and chief kinds of literature, with illustrations drawn from writers both ancient and modern. This and the following courses are mainly designed for prospective college and university teachers.

[106. **Dante in English.** Throughout the year. Professor COOPER. M 11–12:50. Goldwin Smith 127. Given in alternate years, not in 1942–43.]

Reading for the sake of literary and historical perspective, followed by a more intensive study of select cantos of the Commedia. A knowledge of Italian is not required.

107. **Methods of Literary and Linguistic Study.** Throughout the year. Professor COOPER. Given in alternate years.

Reading in the *Encyklopädie* of August Boeckh, followed by a study of more recent treatises with special reference to the ancient classics and English.

109. **Chaucer Seminary.** Throughout the year. Professor COOPER. Tuesday, 7:30 p.m. English Seminary Room.

A survey of books and topics that are essential to the study of Chaucer and his age; systematic reading of his works; a detailed examination of significant problems.

ENGLISH LANGUAGE AND LITERATURE

Professors J. C. ADAMS, R. C. BALD, L. N. BROUGHTON, E. K. BROWN, W. H. FRENCH, C. W. JONES, H. A. MYERS, EDWIN NUNGEZER, W. M. SALE, E. J. SIMMONS, E. A. TENNEY, H. W. THOMPSON, and E. C. WILSON.

Approved Major and Minor Subjects (key to symbols on p. 41)

Old and Middle English 1, 2, 3, 4
Medieval Literature 1, 2, 3, 4
The English Renaissance 1, 2, 3, 4
The Classical Period 1, 2, 3, 4
The Romantic Period 1, 2, 3, 4
The Victorian Period 1, 2, 3, 4
American Literature 1, 2, 3, 4,
Literary Theory and Criticism 1, 2, 3, 4
English Poetry 1, 2, 3, 4
The English Drama 1, 2, 3, 4
Dramatic Literature 1, 2, 3, 4
The English Language 1, 2, 3, 4
Prose Fiction 1, 2, 3, 4

The type of work within each field will vary, according as it is chosen fo major or a minor, and for the Master's or the Doctor's degree.

In their first term of residence, candidates for the degree of Doctor of Philosophy need designate their major fields of study only as "The English Language," "English Literature," or "American Literature." At the beginning of their second term, they are expected to designate the fields as they appear in the list of approved major and minor subjects. Candidates for the degree of Master of Arts must choose their major and minor subjects within two weeks after registration.

In the Cornell University Library are collections suitable for advanced work in every division of English Literature; those in Old and Middle English and in Elizabethan and Nineteenth Century Literature are especially rich. A seminary room for study and small classes is also available. In addition, the Department has a separate collection, the Hart Memorial Library, with many reference-books and ample desk- and table-space. Adjacent to this is the Goldwin Smith Library, in which are other valuable sets and volumes.

The *Cornell Studies in American History, Literature, and Folklore* is a series of monographs in which the work of graduates and members of the staff may be published. Thirty-one numbers have appeared.

In general, thirty-three hours of college English are required before a student may enter upon candidacy for an advanced degree. Work in philosophy, history, and the languages, ancient and modern, may, if it is of good quality, be counted against a shortage in undergraduate English. Training in the Greek and Latin literatures is especially acceptable as preparation for graduate work in English. All candidates for the degree of Doctor of Philosophy must have at least a full year course in Old English; must show, in an examination given during the first term of residence, that they have a general knowledge of English and American literature; and must accomplish satisfactory work in research. The candidate for the degree of Doctor of Philosophy must demonstrate his ability to read both French and German (or two languages, other than English, approved by his Special Committee) by passing in each of these languages an examination given by a member of the Language Examination Board (see page 24). The candidate's Special Committee may also, at its discretion, require a reading knowledge of Latin. The candidate for the degree of Master of Arts must have sufficient knowledge of French or German to make use of scholarly works in one of these languages.

One fellowship of the value of $600, with exemption from tuition, is awarded annually to a graduate student in English. To secure consideration applicants must ordinarily have completed a year of graduate study. The Department also nominates deserving applicants for tuition scholarships (see page 37). Furthermore, a number of part-time teaching appointments are often available to men working for advanced degrees. These carry exemption from tuition fees in the Graduate School in addition to the regular remuneration.

Courses in English open to candidates for advanced degrees are listed below in three groups: I. Undergraduate courses (to be taken by graduate students who need preliminary work); II. Graduate courses primarily intended for students in their first year of graduate work, or for students beginning work in a field new to them; and III. Seminaries designed for advanced graduate students. The candidate for the Master's degree is ordinarily expected to have completed successfully at least three courses from Groups II, or III, or to have completed three courses which his Special Committee deems equivalent in scope and quality. The candidate for the Doctor's degree is ordinarily expected to have completed successfully at least four courses of Group II, and two of Group III, or to have completed six courses which his Special Committee deems equivalent in scope and quality.

Group I. Undergraduate courses: graduate students taking these are expected to do extra work in order to achieve graduate credit. For a full description of these courses, see the *Announcement of the College of Arts and Sciences.*

31. *Medieval Literature.* Throughout the year. Three hours a week.
32. *The English Renaissance.* First term. Three hours a week.
33b. *Restoration Literature.* Second term. Three hours a week.
34a. *Eighteenth Century Literature.* First term. Three hours a week.
35. *The Romantic Revival.* Throughout the year. Three hours a week.
39. *American Literature.* Throughout the year. Three hours a week.
40b. *Modern American Fiction.* Second term. Three hours a week.

42. *The Early Nineteenth Century Novel.* First term. Three hours a week.
43. *The English Novel in the Eighteenth Century.* Second term. Three hours a week.
44. *European Fiction.* Throughout the year. Three hours a week.
45. *The English Drama to 1642.* Throughout the year. Three hours a week.
48. *Modern Drama.* Second term. Three hours a week.
53. *Recent English Poetry.* Second term. Three hours a week.
58. *American Folk Literature.* First term. Three hours a week.
59. *Literary Criticism.* Throughout the year. Three hours a week.
60. *Chaucer and his Age.* Throughout the year. Three hours a week.
61. *Shakespeare.* Throughout the year. Three hours a week.
63. *Milton.* Second term. Three hours a week.
70. *Wordsworth.* Second term. Three hours a week.
71. *Coleridge and Keats.* First term. Three hours a week.
72. *Byron and Shelley.* Throughout the year. Three hours a week.
76. *Carlyle and Browning.* Second term. Three hours a week.
78a. *Emerson, Thoreau, and Whitman.* First term. Three hours a week.
78b. *Poe, Hawthorne, and Melville.* Second term. Three hours a week.
79. *T. S. Eliot.* First term. Three hours a week.
81. *Old and Middle English.* Throughout the year. Three hours a week.
82. *The English Language.* Second term. Two hours a week.

Group II. Graduate courses designed primarily for first-year students or students beginning work in a field new to them.

100. **Bibliography and Method.** An introduction to Graduate Research in English. One hour a week throughout the year. Professor BALD. Th 12. Goldwin Smith 245.

A survey of the principal sources of information and of the various techniques used in literary research. Recommended for all students entering upon graduate study.

101. **Old English Literature.** Either term. Professor ————. Room and hours to be arranged.

102. **Middle English Literature.** Throughout the year. Associate Professor FRENCH. Room and hour to be arranged.

A survey of English literature from 1150 to 1500, with special attention to literary and textual problems; the Arthurian tradition in England; the metrical romances; the dialects.

104. **Medieval Literature.** Throughout the year. Associate Professor JONES. Room and hour to be arranged.

A survey of European literature from the fourth to the fourteenth century, with special emphasis upon the evolution from classical into modern forms and subjects.

107. **Elizabethan Dramatic Literature.** Throughout the year. Assistant Professor ADAMS. F 2–4:30. Goldwin Smith 63.

First term: plays, playhouses, and stagecraft in the years 1550–1660. Second term: representative plays by Shakespeare's contemporaries.

108. **Elizabethan Non-dramatic Literature.** Throughout the year. Associate Professor NUNGEZER. W 3–5:30. Goldwin Smith 245.

A study of representative prose and poetry from Erasmus to Bacon.

[109. **Shakespeare.** Throughout the year. Professor BALD. Not given in 1942–43.]

110. **Seventeenth Century Literature.** Throughout the year. Professor BALD. Th 2. Goldwin Smith 245.

[111. **Spenser.** Second term. Assistant Professor WILSON. Not given in 1942–43.]

112. **Scottish Literature.** Throughout the year. Professor THOMPSON. Room and hour to be arranged.

From Allan Ramsay to the present, with emphasis upon balladry and other

contributions of Scottish letters to the romantic tradition in England and America.

114. **Eighteenth Century Literature.** Throughout the year. Associate Professor SALE. Room and hour to be arranged.

A study of certain aspects of the literature of the century, designed primarily for those who have some knowledge of the period.

116. **Wordsworth and His Contemporaries.** Throughout the year. Professor BROUGHTON. M 4–6. Goldwin Smith 338.

First term: a detailed study of the works of Wordsworth and their influence on contemporary English thought and literature. Second term: the contemporaries of Wordsworth.

130. **Studies in the Romantic Movement.** Throughout the year. Assistant Professor WILSON. Room and hour to be arranged.

135. **Studies in Victorian Literature.** Throughout the year. Professor BROWN. Th 4–6.

The course will center in the examination of aesthetic theories and in a close study of the major works of Browning.

[140. **American Literature.** Throughout the year. Professor THOMPSON. Not given in 1942–43.]

141. **The English Language.** Throughout the year. Professor ————. Room and hour to be arranged.

[142. **Theories of Criticism and Interpretation.** Throughout the year. Associate Professor SALE. Not given in 1942–43.]

[145. **The Technique of the Novel.** Throughout the year. Professor BROWN. Not given in 1942–43.]

150. **Dramatic Structure.** Throughout the year. Associate Professor MYERS. M 3. Goldwin Smith 183.

A study of dramatic history and theory, with reading of representative plays. This course is supplementary to English 23 and 48, which should precede or accompany it.

Group III. Graduate seminaries designed for advanced students, or other students who have had exceptional preparation. The purpose of these seminaries is to bring to the student's attention possible fields for research, and to give advanced instruction in the methods of research. These courses are subject to change from year to year. Places of meeting and hours are to be arranged with the professors in charge.

201. **Old English.** Professor ————.

202. **Middle English.** Associate Professor FRENCH.

208. **Elizabethan Literature.** Associate Professor NUNGEZER.

210. **Topics in Dramatic History before 1700.** Professor BALD.

215. **The English Novel.** Professors BROWN and SALE.

216. **The Romantic Period.** Professor BROUGHTON.

240. **American Literature.** Associate Professor MYERS and Professor THOMPSON.

241. **The English Language.** Professor ————.

250. **Dramatic Structure.** Associate Professor MYERS.

GERMANIC LANGUAGES AND LITERATURES

GERMAN

Professors P. R. POPE, A. L. ANDREWS, H. SCHNEIDER, and V. LANGE.

Approved Major and Minor Subjects (key to symbols on p. 41)

German Literature 1, 2, 3, 4
Germanic Philology 1, 2, 3, 4

In the advanced courses in this subject the work is twofold, literary and philological. The history of German literature from the earliest period to the

present day is sketched in outline lecture courses with collateral reading. Special topics are selected for detailed study such as the epic and lyric poetry of the Middle High German period, the literature of the Reformation, the classical period, the drama of the nineteenth century, and contemporary literature. The courses offered in philology include the study of Gothic and of Old and Middle High German. They also afford an introduction to the science of language.

The seminaries in German literature and philology aim to impart the principles and methods of investigation. A teachers' course deals with classroom methods and theories of instruction in the modern languages.

All the work in German is greatly facilitated by an exceptional library equipment. The nucleus was formed by the acquisition of the Zarncke library, one of the largest collections of rare books for the study of German literature and philology ever brought to America. With constant enlargements the library has become one of the most serviceable in the country. The German Seminary Room in the University Library contains books for ready reference, including philological journals and reviews.

Candidates for advanced degrees in German are expected to have an adequate knowledge of French and Latin. A fellowship in German is awarded annually.

1. *Course for Beginners.* Second term. Six hours a week.

1a. *Course for Beginners.* Throughout the year. Three hours a week.

1c. *Course for Chemical Engineers.* Throughout the year. Three hours a week.

1g. *Course for Graduates.* M W F 8. Goldwin Smith 177.

Intended for those graduate students who have no knowledge of German and must prepare themselves for the reading examination in it. The first term is devoted to the fundamentals of grammar, the second term to conferences with individual students or groups of students upon readings assigned them on subjects connected with their special fields of study.

3a. *Intermediate Course.* Throughout the year. Three hours a week.

4. *Elementary German Composition and Conversation.* Throughout the year. Three hours a week.

5. *Reading of Modern German Texts.* Throughout the year. Three hours a week.

7. *German Literature from Goethe to the Present.* Throughout the year. Two hours a week.

8. *Scientific German.* Second term. Three hours a week.

10. *Advanced German Composition and Conversation.* Throughout the year. Three hours a week.

11. *Schiller's Life and Works.* Second term. Three hours a week.

13. *Goethe's Life and Works,* including *Faust.* Throughout the year. Three hours a week.

[15. *Survey of German Literature.* Both terms. Three hours a week. Not given in 1942–43.]

17. *Nineteenth Century Drama.* First term. Three hours a week.

18. *Lessing's Life and Works.* First term. Three hours a week.

[19. *German Lyric Poetry from Goethe to George.* Second term. Three hours a week. Not given in 1942–43.]

[20. *The German Novel from Goethe to the Present.* First term. Three hours a week. Not given in 1942–43.]

21. *Bibliographical Introduction to the History of German Literature.* First term. Two hours a week.

25. *Wagner's Life and Works.* Second term. Three hours a week.

26. **Contemporary German Literature.** Second term. Three hours a week. Associate Professor SCHNEIDER.

35. **German Romanticism.** Second term. Two hours a week. Associate Professor LANGE. By appointment.

[36. **Friedrich Nietzsche.** Second term. Two hours a week. Associate Professor LANGE. Not given in 1942–43.]

37. **Middle High German.** First term. Three hours a week. Professor POPE. M W F 3. Goldwin Smith 182.

[40. *Teachers' Course in Methods.* Second term. Two hours a week. Not given in 1942–43.]

42. **Gothic.** First term. Three hours a week. Professor ANDREWS. By appointment.

This course will serve as a general introduction to Germanic philology.

43. **Old High German.** Second term. Three hours a week. Prerequisite, German 37. Professor ANDREWS. M W F 3. Goldwin Smith 178.

A study, mainly linguistic, of the oldest German texts. It should be preceded by the course in Gothic.

49. **Seminary in German Literature.** First term. Two hours a week. Associate Professor LANGE. By appointment.

Select problems in seventeenth century literature.

52. **Seminary in Germanic Philology.** Second term. Two hours a week. Professor ANDREWS. F 3–5. Goldwin Smith 178.

Germanic Antiquities. A consideration of our sources of knowledge of the Germanic people up to and including the migrations.

SCANDINAVIAN

Professor HALLDOR HERMANNSSON.

Approved Major and Minor Subjects (key to symbols on p. 41)

Danish, Norwegian, Swedish Literature 3, 4
Modern Icelandic Literature 2, 3
Old Norse-Icelandic Language and Literature 1, 2
Old Norse-Icelandic Literature 2, 3, 4

The Fiske Icelandic Collection of the University Library, comprising about 20,000 books and pamphlets, offers excellent facilities for advanced work in Old Norse-Icelandic language and literature, Norse mythology and heroic legends, runology, and early Scandinavian history, as well as in Modern Icelandic language and literature. The Library also has a small collection of books on the other modern Scandinavian languages and literatures to which some additions are made annually.

1. **Old Icelandic.** Throughout the year. T Th S 11. Library, Greek and Latin Seminary.

2. **Modern Icelandic.** Second term. Three hours a week. Hours to be arranged.

[3. **Danish and Dano-Norwegian.** First term. Three hours a week. Given in alternate years, not in 1942–43.]

4. **Swedish.** First term. Three hours a week. T Th S 12. Given in alternate years.

5. **Old Norse-Icelandic Literature.** First term. Two hours a week. W F 12.

[6. **Modern Scandinavian Literature.** Second term. Two hours a week. Given in alternate years, not in 1942–43.]

7. **Early Scandinavian Civilization and History.** Second term. Two hours a week. W F 12. Given in alternate years.

SPEECH AND DRAMA

Professors A. M. DRUMMOND, H. A. WICHELNS, HARRY CAPLAN, W. H. STAINTON, R. H. WAGNER, C. K. THOMAS, G. B. MUCHMORE, and H. D. ALBRIGHT.

Approved Major and Minor Subjects (key to symbols on p. 41)

Division of Rhetoric and Public Speaking

Rhetoric and Public Speaking 1, 2, 4
Principles of Public Address 3, 4
History of Public Address 3, 4
Classical Rhetoric 3, 4
Medieval Rhetoric 3, 4

Division of Dramatic Production

Drama and the Theatre 1
Dramatic Production 2, 3, 4
Playwriting 2, 3, 4
Theatre Techniques 2, 3, 4

Division of Phonetics

Speech and Phonetics 2, 3, 4

The chief aim of graduate work in rhetoric and in dramatic production is to develop competent investigators and teachers for colleges and universities. In many cases, the work will require more than the minimum periods of residence. Ordinarily, residence in this University during two academic years will be necessary for the attainment of the doctorate.

Properly qualified students may select Speech Training and Phonetics as a major subject for the Master's degree; as a minor subject for either degree.

Candidates for the Doctor's degree whose major interest is in Rhetoric, that is, in the principles, history, and criticism of public address, will usually be well advised to choose one minor subject from the field of literary history and criticism or from that of the social sciences.

Candidates for the Doctor's degree whose major interest is in Drama and the Theatre will be required to take Dramatic Literature as a minor subject, unless they have already pursued systematic study in dramatic literature, and such candidates must expect to be in residence two years and one summer beyond the requirements for the Master's degree. If preparing for general teaching, candidates will be advised to take additional courses in Public Speaking and Speech Training.

Candidates for the Master's degree in Dramatic Production will require at least one academic year and one summer session of residence.

The degree of Master of Fine Arts in Drama will be granted to candidates showing special aptitude in the practical phases of Dramatic Production or Playwriting. Their program must include suitable studies in related Fine Arts; two years of residence will normally be required; and a major practical project in the second year will be the thesis.

Opportunities for theatre practice of which students will be expected to avail themselves are afforded by various branches of THE CORNELL UNIVERSITY THEATRE, as follows: in the *Laboratory Theatre*, for public presentations of the work of graduate students in Dramatic Interpretation and Acting; in the *Studio Theatre*, for production of the work in Playwriting; and in the *Summer Theatre*, for intensive work in all phases of theatre practice. *Director of the University Theatre*, A. M. DRUMMOND; *Assistant Director*, W. H. STAINTON; *Company Director*, H. D. ALBRIGHT; *Technical Director*, JOEL TRAPIDO.

[7. **Discussion.** Associate Professor WAGNER. Not given in 1942–43.]

[13. **Advanced Argumentation.** Associate Professor WAGNER. Not given in 1942–43.]

16. **Forms of Public Address.** Throughout the year. Professor WICHELNS. T Th 10 and an hour to be arranged.

21. **History of Public Address.** Throughout the year. Professor WICHELNS. M Th 2–3:15.

[23. **Theories of Public Address.** Associate Professor WAGNER. Not given in 1942–43.]

[24. **Public Opinion and the Method of Argument.** Professor WICHELNS. Not given in 1942–43.]

[25. **British Rhetoric and Oratory.** Associate Professor WAGNER. Not given in 1942–43.]

32. *Phonetics and Speech Training.* First term. Associate Professor THOMAS and Mr. HARDY. M W F 9.

33. **Regional and Historical Phonetics.** Second term. Associate Professor THOMAS. M W F 9.

[34. **Principles of Phonetics.** Associate Professor THOMAS. Not given in 1942–43.]

36. **Principles and Methods of Speech Correction.** Throughout the year. Associate Professor THOMAS. T 2–4 and an hour to be arranged.

41. **Dramatic Production: Direction.** First term. Associate Professor STAINTON. M W F 11. Morse, Stage Laboratory.

Dramatic interpretation and the related principles of stage direction and production.

42. **Advanced Dramatic Interpretation and Acting.** Throughout the year. Professor DRUMMOND and Assistant Professor ALBRIGHT. Both terms, W 2–4.

A practical course in direction, rehearsal, and acting, leading to public presentations in the Laboratory Theatre; special attention to oral interpretation.

45. **Dramatic Production: Stagecraft.** Second term. Associate Professor STAINTON. M W 11. Laboratory, T 1:40–4, or as arranged. Morse, Stage Laboratory.

Stage production; problems and practice in construction and design.

45a. **Dramatic Production: Stage Lighting.** First term. Associate Professor STAINTON. T 1:40–4, or as arranged. Morse, Stage Laboratory.

[46. *Stage Design and Theatre Crafts.* Not given in 1942–43.]

[47. *History of Theatrical Costume.* Not given in 1942–43.]

48. **History of the Theatre.** Second term. Professor DRUMMOND. T Th S 11. Goldwin Smith Museum.

Lectures on the development of the theatre with special attention to influences on modern stage presentation.

49b. **Playwriting.** Throughout the year. Professor DRUMMOND. Hours to be arranged. Goldwin Smith 244.

91. **Theatre Practice.** Throughout the year and summer session. Professor DRUMMOND or Associate Professor STAINTON. Hours to be arranged.

Projects correlated with the work of the University Theatre.

[**Studies in Greek and Roman Rhetoric and Oratory.** Professor CAPLAN. See Greek 33. Not given in 1942–43.]

Dramatic Literature. See English 48 and 61.

Fine Arts. See especially Fine Arts 1a, 1b (History of Painting and Sculpture); Philosophy 8a, 8b; Music 5, 10.

Seminary Courses

[60. **Rhetorical Criticism.** Associate Professor WAGNER. Not given in 1942–43.]

[62. **Philosophy of Rhetoric.** Professor WICHELNS. Not given in 1942–43.]

63. **Speech Training.** Throughout the year. Associate Professor THOMAS Hours to be arranged.

General Phonetics; theory of voice and speech.

66. **Theories of Dramatic Production.** First term. Professor DRUMMOND T Th 12. Goldwin Smith 242.

The chief theories of dramatic production in relation to aesthetic principles.

67. **Dramatic Art.** Throughout the year. Professor DRUMMOND. Hours to be arranged. Goldwin Smith 244.

68. **Modern Theories of Stage Presentation.** Throughout the year. Associate Professor STAINTON. Hours to be arranged. Goldwin Smith 239.

A study of the work of Craig, Appia, Fuchs, and others who have influenced contemporary stage production.

Dramatic Structure. See especially English 150, 250. Associate Professor MYERS.

ROMANCE LANGUAGES AND LITERATURES

Professors J. F. MASON, LAURENCE PUMPELLY, G. I. DALE, M. G. BISHOP, T. G. BERGIN, and B. L. RIDEOUT.

Approved Major and Minor Subjects (key to symbols on p. 41)

French Language 1, 2, 3, 4
French Literature 1, 2
French Philology 1, 2, 3, 4
Medieval French Literature 3, 4
French Literature of the Sixteenth Century 3, 4
French Literature of the Seventeenth Century 3, 4
French Literature of the Eighteenth Century 3, 4
French Literature of the Romantic Period 3, 4
Modern French Literature 3, 4
Contemporary French Literature 3, 4
General History of French Literature 3, 4
Italian 1, 2, 4
Spanish Language 1, 2, 3, 4
Spanish Literature 1, 2, 3, 4
Spanish Literature of the Renaissance 1, 2, 3, 4
Spanish Literature of the Golden Age 1, 2, 3, 4
Modern Spanish Literature 1, 2, 3, 4
Spanish Literature of the 18th Century 3, 4
Spanish Literature of the 19th Century 3, 4

The collection of French and Spanish books in the University Library is very large, and offers excellent facilities for advanced work. Objects of special pride are the unrivalled Dante and Petrarch collections, the gift of the late Willard Fiske, who likewise presented to the University a unique collection of Rhaeto-Romance works. Smaller collections of Portuguese, Provençal, and Catalan books are also to be found in the University Library. The seminary library contains several thousand volumes including many sets of bound periodicals. A university fellowship in Romance languages (of the value of $400 and free tuition) is annually awarded. This fellowship is ordinarily awarded only to an applicant who has had one year or more of graduate study.

The courses of study in this department are divided into three categories: those intended primarily for undergraduates, those intended alike for undergraduates and graduates, and those intended primarily for graduates. A working knowledge of Latin is especially desirable for all candidates for advanced degrees in this department. All candidates for the degree of Doctor of Philosophy must satisfy the language requirement in French and German before beginning to earn the fourth term of residence credit (see page 24). A graduate student in Romance languages should have completed some formal course of study in the language and literature of the language which he intends to select as his major subject, and should have adequate preparation for advanced work in his minor subjects.

A candidate for the degree of Master of Arts whose major subject is in Romance languages is expected to present for the approval of the chairman of his Special Committee, within two weeks after registration day, an outline of the work planned for the year. The thesis must, before May 1, be submitted for the criticism of the chairman of the candidate's Special Committee. If not already taken, a course in the philology of the language which constitutes their major subject is required of graduate students in their first year of study.

Candidates for the degree of Doctor of Philosophy are expected to follow advanced courses given in the field in which their major subject lies and to take up such work as will give a comprehensive view of the fields in which their minor subjects lie. It is intended that the last year of preparation for this degree shall be spent chiefly upon the thesis. Further information may be obtained from the professors in this department.

French

Professors Mason, Pumpelly, Bishop, and Bergin; *Assistant Professor* Rideout.

1. *First Course for Beginners.* Throughout the year. Three hours a week.

1g. **First Course for Graduate Students.** Throughout the year. T Th S 8, or

another hour at the convenience of the class. The emphasis is chiefly on the attainment of a reading knowledge of French.

3a. *Second Course.* Throughout the year. Three hours a week.
4a. *Reading of French.* Either term. Three hours a week.
4b. *Reading of French.* Second term. Two hours a week.
5a. *Written and Spoken French.* Either term. Three hours a week.
5b. *Written and Spoken French.* Either term. Three hours a week.
5c. *Written and Spoken French.* Second term. Three hours a week.
6. *Freshman French: Reading and Composition.* Throughout the year. Three hours a week.
7. *Written and Spoken French.* Throughout the year. Three hours a week.
9. *Written and Spoken French.* Throughout the year. Three hours a week.
[10. *French Civilization.* Second term. Two hours a week. Not given in 1942–43.]
16. *History of French Literature.* Throughout the year. Professor MASON. M W F 11.
[17. *Literature of the Seventeenth Century.* Throughout the year. Professor BISHOP. Not given in 1942–43.]
18. *Literature of the Eighteenth Century.* Throughout the year. Professor BISHOP. M W F 11.
19. *The Romantic Movement in French Literature.* Throughout the year. Professor MASON. M W F 9.
[20. *Modern French Literature.* Throughout the year. Professor MASON. M W F 9. Not given in 1942–43.]
[21. *Contemporary French Literature.* Throughout the year. Professor MASON. M W F 9. Not given in 1942–43.]
[23. *French Historical Grammar.* First term. Professor PUMPELLY. T Th 10. Not given in 1942–43.]

24. **French Philology.** Throughout the year. Prerequisite, college entrance Latin or the equivalent. Professor PUMPELLY. T 10, Th 2.
Lectures on the historical development of the French language, with a detailed phonological and morphological study of the *Chanson de Roland.*

[31. **Literature of the Sixteenth Century.** Throughout the year. Professor BISHOP. T Th 12. Not given in 1942–43.]
A study of the important figures of the French Renaissance, especially Rabelais, Montaigne, and the poets of the Pléiade.

41. **Old French Texts.** Second term. Professor BERGIN. Hours to be arranged.

[42. **Old Provençal Philology and Literature.** Second term. Credit two hours. Professor BERGIN. Hours to be arranged. Not given in 1942–43.]

47. **Modern French Seminary.** Throughout the year. Credit two hours. Professor MASON. T 2:30. Library, French Seminary.
A topic in French literary history is studied by means of lectures, readings, reports, individual and collective research. The course serves as an introduction to methods of literary history.

ITALIAN

Professors PUMPELLY and BERGIN.

1. *First Course.* Throughout the year. Three hours a week.
5. *Second Course.* Throughout the year. Three hours a week.
15. *Dante.* Throughout the year. Three hours a week.

SPANISH

Professor DALE.

1. *First Course for Beginners.* Throughout the year. Three hours a week.
3a. *Second Course.* Throughout the year. Three hours a week.
6. *Freshman Spanish.* Throughout the year. Three hours a week.
7a. *Intermediate Composition.* First term. Three hours a week.
7b. *Intermediate Composition.* Second term. Three hours a week.

8. *Spoken Spanish.* Throughout the year. One hour a week.

10. *History of Spanish Literature.* Throughout the year. Three hours a week.

[15. *Drama of the Golden Age.* First term. Three hours a week. Not given in 1942–43.]

[17. *Cervantes.* First term. Three hours a week. Not given in 1942–43.]

18. *The Spanish-American Novel.* Throughout the year. Three hours a week.

[19. *The Nineteenth Century Spanish Novel.* Second term. Three hours a week. Not given in 1942–43.]

20. *Latin-American Culture.* Throughout the year. Two hours a week.

[21. *Spanish Literature since* 1898. Throughout the year. Three hours a week. Not given in 1942–43.]

[41. **Old Spanish.** Throughout the year. Credit two hours a term. W 2:15. Library, Spanish Seminary. Not given in 1942–43.]

A philological and morphological study of old Spanish texts, with special emphasis on the *Poema del Cid.*

[42. **Calderón and Alarcón.** Throughout the year. Credit two hours a term. W 2:15. Library, Spanish Seminary. Not given in 1942–43.]

Selected plays by each author will be analyzed in an effort to determine their contributions which are not in the Lope tradition.

43. **The Picaresque Novel.** Throughout the year. Credit two hours a term. W 2:15. Library, Spanish Seminary. A detailed study will be made of one picaresque novel.

PORTUGUESE

Professor DALE.

1. *First Course for Beginners.* Throughout the year. Three hours a week.

SLAVIC

Associate Professor E. J. SIMMONS and *Dr.* J. A. POSIN.

Approved Major and Minor Subjects (key to symbols on p. 41)

Slavic Philology 1, 3
Mediaeval Russian Literature 1, 2, 3, 4
Russian Literature, 16th to 17th Century 3, 4
Russian Literature, 18th Century 1, 2, 3, 4
Russian Literature, Romantic Period 1, 2, 3, 4
Continental Literary Influences on Russia 1, 2, 3, 4
Russian Literature, 1800–1850, 1, 2, 3, 4
Russian Literature, 1850–1900, 1, 2, 3, 4
Contemporary Russian Literature 1, 2, 3, 4
Russian Folklore 3, 4
Russian Literary Theory and Criticism 1, 2, 3, 4
Russian Drama and Theatre 1, 2, 3, 4
Russian Prose Fiction 1, 2, 3, 4
Polish Language and Literature 4

Graduate work in Slavic is directed towards a thorough knowledge of the Russian language and literature and some knowledge of at least one other Slavic language. A candidate for the higher degrees will also be expected to obtain substantial background information on Russian political and social history.

Group I. Undergraduate courses: graduate students taking these courses are expected to do extra work in order to achieve graduate credit. For a full description of these courses see the *Announcement of the College of Arts and Sciences.*

2. *Second-Year Russian.* Throughout the year. Three hours a week.

3. *Third-Year Russian.* Throughout the year. Three hours a week.

4. *Advanced Russian.* Throughout the year. Three hours a week.

5. *Introduction to Russian Literature and Culture.* Throughout the year. Three hours a week.

7. *Dostoevski.* First term. Three hours a week.
8. *Tolstoy.* First term. Three hours a week.
9. *Russian Drama.* Second term. Three hours a week.

Group II. Designed primarily for graduate students.

6. **Pushkin.** Representative readings and interpretation of Pushkin's poetry and prose. Second term. Credit three hours. Associate Professor SIMMONS. T Th S 10. Goldwin Smith.

20. **Polish.** Elementary Polish. Throughout the year. Three hours each term. Dr. POSIN. M W F. 214 Boardman. Hours to be arranged.
Grammar, reading, writing, elementary composition. The course is primarily designed to give the student a reading knowledge of the language.

30. **Old Church Slavic.** First term. Three hours. Hours to be arranged. 214 Boardman. Dr. POSIN.

31. **Mediaeval Russian Literature.** Second term. Three hours. Hours to be arranged. 214 Boardman. Dr. POSIN.
A continuation of Slavic 30.

SUSAN LINN SAGE SCHOOL OF PHILOSOPHY

Professors G. WATTS CUNNINGHAM, GEORGE H. SABINE, E. A. BURTT, HAROLD R. SMART, RICHARD ROBINSON, and RALPH W. CHURCH.

The Susan Linn Sage School of Philosophy was founded through the generosity of the late Henry W. Sage, who endowed the Susan Linn Sage Professorship and gave in addition $200,000 to provide permanently for instruction and research in philosophy.

The *Philosophical Review*, supported by the University and issued under the auspices of the Sage School, is a bi-monthly journal devoted to the interests of philosophy, including logic, metaphysics, ethics, aesthetics, the history of philosophy, and the philosophy of religion. By the terms of its establishment, the *Review* is an absolutely free organ of philosophical scholarship, not devoted to the propagation of any doctrine. The *Cornell Studies in Philosophy* are a series of monograph studies, published from time to time under the editorial supervision of the professors of the School. They offer a channel for the publication of studies begun as dissertations for the doctorate or of other research. Seventeen monographs have been issued.

The instruction offered to graduate students presupposes such undergraduate courses in the subject as would be taken by a student in the College of Arts and Sciences of Cornell University who had elected philosophy as a major subject. Those who have not had equivalent preparation are expected to make up their deficiencies outside the work required for an advanced degree.

The Sage School provides opportunity for advanced study to two classes of graduate students: (1) those whose chief branch of research is in allied fields but who desire to supplement this with a minor in philosophy; (2) those whose major interest is in some branch of philosophy.

1. Graduate students having a major interest in literature or the arts, in history or social studies, or in mathematics or a branch of experimental science, are permitted to choose a minor in philosophy with such emphasis as best suits their needs. For such students the School endeavors to outline a plan of philosophical study (in courses or directed reading) which will form a natural supplement to their field of research.

2. Students whose major interest is in philosophy are required (a) to gain a general knowledge of the whole subject including its history, and (b) to select some aspect or subdivision of it for intensive study and research. The following subjects may be chosen as majors and minors: aesthetics, ethics, history of philosophy, logic and epistemology, metaphysics, and philosophy of religion. Students are encouraged to choose one minor in a subject other than philosophy.

The Sage School offers a Graduate Prize in Philosophy, having an annual value of about twenty-five dollars, for the best essay embodying the results of research. See page 39 above.

The School offers also three Susan Linn Sage Fellowships in Philosophy, having an annual value of $600 each. It reserves the right, however, to divide one or more of these fellowships into two scholarships of $300 each. Both scholarships and fellowships carry free tuition in the Graduate School in addition to the stipend.

PHILOSOPHY

Approved Major and Minor Subjects (key to symbols on p. 41)

Aesthetics 1, 2, 3, 4
Ethics 1, 2, 3, 4
History of Philosophy 1, 2, 3, 4
Logic and Epistemology 1, 2, 3, 4
Metaphysics 1, 2, 3, 4
Philosophy 4
Philosophy of Religion 1, 2, 3, 4

1. *Philosophical Classics.* Either term. Three hours a week.
2. *Logic.* Either term. Three hours a week.
3. *Problems of Philosophy.* Second term. Three hours a week.
4. *Ethics.* Second term. Three hours a week.
5. *History of Philosophy.* Throughout the year. Three hours a week.
8a. *Aesthetics: Psychology of Art.* First term. Three hours a week.
8b. *Aesthetics: Philosophy of Art.* Second term. Three hours a week.
10. *Modern Political Theory.* Second term. Three hours a week.
13. *The Philosophy of Religion.* Second term. Three hours a week.
14. *History of Religions.* First term. Three hours a week.
15. *Philosophy of Science.* Throughout the year. Three hours a week.
16. *Advanced Logic.* Throughout the year. Three hours a week.

Symbolic Logic. (See Mathematics 110.)

[19. **Advanced Readings in Aesthetics.** First and second terms. Associate Professor CHURCH. Hours by apointment. Goldwin Smith 224. Not given in 1942–43.]

Readings to be selected in accordance with the interests and preparation of the student.

[20. **Contemporary Philosophy.** Throughout the year. Professor BURTT. M W F 9 or hours to be arranged. Goldwin Smith 220. Not given in 1942–43.]

Main tendencies of contemporary philosophy, especially British and American.

23. **Philosophy of Religion. Advanced Course.** First term. Professor BURTT. To be given at the discretion of the instructor. Th 2–4. Goldwin Smith 218.

A study of special topics in the field. The seminar method will be used.

25. **Plato and Aristotle.** Throughout the year. For upperclassmen and graduates. Credit three hours a term. First term prerequisite to second. Associate Professor ROBINSON. T Th S 11. Goldwin Smith 220. Given in alternate years; given in 1942–43.

A philosophical study of the two greatest ancient thinkers, with substantial readings from their works in translation.

28. **Ethical Theory.** First term. Associate Professor ROBINSON. M W F 10. Goldwin Smith 220.

A rapid reading of examples of the main types of modern ethical theory.

29. **The Philosophy of Value.** Second term. Mr. BROWN. M W F 10, or hours to be arranged. Goldwin Smith 220.

A study in Naturalist, Realist, and Idealist theories of value.

30. **Empiricism and Rationalism.** Throughout the year. Professor SABINE and Associate Professor SMART. M W F 2, or hours to be arranged. Goldwin Smith 220.

The general history of the two schools with a critical analysis of the main works of Descartes, Leibniz, Locke, and Hume.

[32. **The Critical Philosophy of Kant.** Throughout the year. Professor SABINE and Associate Professor SMART. F 3, or hours to be arranged. Goldwin Smith 220.

A reading of the principal works of the Critical Period. Not given in 1942–43.]

[33. **The Philosophy of Hegel.** Throughout the year. Professor CUNNINGHAM. W 11–1, or hours to be arranged. Goldwin Smith 220. Not given in 1942–43.]

A critical analysis of the philosophy of Hegel with special emphasis on the *Phenomenology* and the *Logic.*

39. **Seminar in Contemporary Philosophy.** Second term. Professor CUNNINGHAM. W 11–1, or hours to be arranged. Goldwin Smith 220.

Topic for 1942–43: Meaning.

40. **Seminar in Logic.** Either term. Associate Professor SMART. To be given at the discretion of the instructor. T 2, or hours to be arranged. Goldwin Smith 220.

Topic for 1942–43: Problems in contemporary logic.

42. **Seminar in Ancient and Medieval Philosophy.** Throughout the year. Prerequisite, Philosophy 25. Associate Professor ROBINSON. Time and place to be arranged.

Topic for 1942–43: Plotinus, or to be arranged.

[43. **Seminar in Political Theory.** Throughout the year. Professor SABINE. F 2:30, or hours to be arranged. Goldwin Smith 220. Not given in 1942–43.]

44. **Seminar in Epistemology.** Throughout the year. Professor BURTT. M 3:30, or hours to be arranged. Goldwin Smith 218.

Topic for 1942–43: Are philosophical statements either true or false?

[45. **Seminar in Aesthetics.** Second term. Associate Professor CHURCH. Goldwin Smith 220. Not given in 1942–43.]

[46. **Departmental Seminar.** Second term. Departmental staff. Hours to be arranged. Goldwin Smith 220. Not given in 1942–43.]

HISTORY AND THE SOCIAL SCIENCES

The subjects of history, economics, and government have been united since 1887 in the PRESIDENT WHITE SCHOOL OF HISTORY AND POLITICAL SCIENCE, which bears the name of the first president of the University in especial recognition of the gift of his valuable collection of historical literature to the University Library.

The aims of the President White School are threefold: first, the advancement of knowledge by investigation and publication in the fields of history, economics, politics, jurisprudence, and social science; second, the training of scholars and teachers in these departments of study; third, the training of men and women for the public service, for business, and for professions such as law and journalism.

ECONOMICS

Professors DONALD ENGLISH, P. T. HOMAN, M. S. KENDRICK, R. E. MONTGOMERY, P. M. O'LEARY, H. L. REED, and F. A. SOUTHARD; *Assistant Professors* ADAMS and HUTCHINS.

Approved Major and Minor Subjects (key to symbols on p. 41)

Economic History 1, 2, 3, 4
Economic Theory and its History 1, 2, 3, 4

Note. Every candidate for the Ph.D. or A.M. degree who does not elect Economic Theory and Its History as a major or a minor subject will be held for certain required work in that subject.

Labor and Industrial Relations 1, 2, 3, 4
Money, Banking, and International Finance 1, 2, 3, 4
Organization and Control of Industry 1, 2, 3, 4
Public Finance 1, 2, 3, 4

Requirements for the Degree of Ph.D. in the Several Fields of Study

ECONOMIC THEORY AND ITS HISTORY.—When offered as a major: (1) a good general knowledge of the history of economic thought including the classical school and its critics, the more recent important schools of thought, and the principal contemporary theorists; (2) familiarity with the methods of economic analysis and with controversial areas of thought; (3) a detailed knowledge of some period or school together with necessary historical and intellectual background thereto. (4) a knowledge of social and intellectual history sufficient to form a background for an understanding of the development of economic thought.

When offered as a minor: Parts 1, 2, and 4 of above requirement.

MONEY, BANKING, AND INTERNATIONAL FINANCE.—When offered as a major: (1) a detailed understanding of the theory and history of money; monetary system of the U. S.; theory and history of banking; present banking system of the U. S.; foreign exchange; monetary aspects of cyclical fluctuations; (2) an understanding of leading monetary systems of the world; modern central banking theory and practice; banking systems of Canada, England, France, and Germany; international movement of capital.

When offered as a minor: Part 1 of above requirement.

ECONOMIC HISTORY.—When offered as a major: (1) a comprehensive knowledge of the evolution of agriculture, industry, and commerce in ancient and medieval times together with an understanding of contemporaneous economic ideas; (2) a comprehensive knowledge of economic history of modern times (in Western World) together with an understanding of intellectual and political movements which have influenced the development of modern economic institutions; (3) a detailed knowledge of at least one special phase of economic history; (4) a knowl-

edge of the bibliography of economic history and ability to appraise the more important generalizations of economic history.

When offered as a minor: Parts 2 and 3 of above requirement.

LABOR AND INDUSTRIAL RELATIONS.—When offered as a major: A good general knowledge of the following divisions of the field of Labor and Industrial Relations and the literature pertaining to each: (1) trade unionism, collective bargaining and industrial arbitration; (2) history, theory, and application of labor law; (3) labor management and personnel problems; (4) the national income, its sources and distribution; (5) labor movements and dissenting or protesting economic thought; (6) social insurance. As a background the candidate should have a grasp of the general field of labor conditions and problems, evolution of the wage system, basic material with respect to wage trends, physical production trends, distribution of wealth and income, and the general field of social legislation, together with demonstrated ability to apply quantitative and theoretical methods to problems in the field of industrial relations.

When offered as a minor: two or three of the divisions listed above.

ORGANIZATION AND CONTROL OF INDUSTRY.—When offered as a major: (1) a good general knowledge of the organization of industry; (2) an understanding of the problems of control arising in connection with transportation, public utilities, and industrial combinations; (3) a detailed knowledge of organization and problems of control in one of the above three general areas of industry; (4) a knowledge of accounting and corporation finance and, in specific cases, of statistics; (5) a knowledge of constitutional law.

When offered as a minor: Part 1 and a knowledge of corporation finance, accounting, and the problems of control in one general area of industry; and a *detailed* knowledge of accounting *or* corporation finance *or* the problems of control in one general area of industry.

PUBLIC FINANCE.—When offered as a major: (1) a thorough knowledge of the principles and problems of public expenditures and revenues, and of governmental financial policies; (2) an adequate grasp of the facts concerning federal, state, and local public finance in the U. S.; (3) an understanding of these facts in terms of the problems which arise out of them; (4) ability to evaluate ways and means of solving these problems; (5) a broad understanding of the place of public finance in the economic and political order; (6) such specialized knowledge as may be needed for the preparation of a thesis. [Candidates should be grounded in accounting, statistics, finance, and government. Knowledge of the law of taxation, comparative systems of public finance, financial history, and social and political ethics is desirable.]

When offered as a minor: Parts 1 and 5 of the above requirements.

Requirements for the Degree of A.M. in the Several Fields of Study

Graduate students offering any of the several fields in economics as a major or minor for the A.M. degree should consult with members of the Department of Economics to ascertain the exact requirements. In general, the major requirements for the A.M. degree are substantially the equivalent of the minor requirements for the Ph.D. degree.

For Undergraduates and Graduates

11. *Money, Currency, and Banking.* Either term. Three hours a week.

12. *Commercial Banking and the Federal Reserve System.* Second term. Three hours a week.

13. *Financial History of the United States.* Second term. Three hours a week.

15. *Trade Fluctuations.* First term. Three hours a week.

21a. *Accounting.* Either term. Three hours a week.

21b. *Accounting.* Either term. Three hours a week.

26. *Accounting Theory and Problems.* Throughout the year. Three hours a week.

31. *Corporation Finance.* Either term. Three hours a week.

32a. *Public Control of Business.* First term. Three hours a week.
32b. *Public Control of Business.* Second term. Three hours a week.
34. *Economics of Transportation.* First term. Three hours a week.
36. *Taxation.* Second term. Three hours a week.
41. *Labor Conditions and Problems.* First term. Three hours a week.
42. *Trade Unionism and Collective Bargaining.* Second term. Three hours a week.
44. *Industrial Relations Policies of American Enterprise.* Second term. Two hours a week.
45. *The Economics of Dissent.* First term. Two hours a week.
46. *Legal and Constitutional Aspects of Labor Problems and Social Insurance.* Second term. Two hours a week.
61a. *Economic History since* 1750. First term. Three hours a week.
61b. *Economic History since* 1750. Second term. Three hours a week.
71. *International Trade and Commercial Policy.* First term. Three hours a week.
72. *International Finance.* Second term. Three hours a week.
[74. *International Economic Organization.* Second term. Three hours a week. Not given in 1942–43.]
81. *Economics of Enterprise.* First term. Three hours a week.
82. *Economic Analysis.* Second term. Three hours a week.
83. *History of Modern Economic Thought.* Throughout the year. Three hours a week.

Primarily for Graduates

The following seminar courses usually meet for two hours a week throughout the year. The subject matter dealt with changes from year to year and registration for them may be repeated. The offering of these seminar courses is uncertain during the war period.

110. **Money and Credit.** Professor REED.
130. **Control of Industry.** Professor O'LEARY.
140. **Labor Economics.** Professor MONTGOMERY.
150. **Public Finance.** Professor KENDRICK.
160. **Economic History.** Assistant Professor HUTCHINS.
170. **International Economics.** Professor SOUTHARD.
180. **Economic Theory.** Professor HOMAN.

AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

See under AGRICULTURE, p. 123.

ECONOMICS OF THE HOUSEHOLD

See under HOME ECONOMICS, p. 177.

GOVERNMENT

Professors R. E. CUSHMAN, H. W. BRIGGS, and F. M. WATKINS; *Doctors* ELIAS HUZAR and D. B. TRUMAN.

Approved Major and Minor Subjects (key to symbols on p. 41)

American Governmental Institutions 1, 2, 3, 4
Constitutional Law 1, 2, 3, 4
International Law and Relations 1, 2, 3, 4
Political Theory 1, 2, 3, 4
Comparative European Government 1, 2, 3, 4

Note. Other subjects may be chosen in consultation with members of the department.

Graduate courses in Government afford an opportunity to students to carry on research in that field. As preparation for such work a familiarity with the essentials

of American political institutions and of the principal systems of European government is assumed, as well as at least an elementary knowledge of American and English or European history. For 1942–43 research in Government will be directed primarily in the fields of American Constitutional Law, Political Theory, and International Law and Relations, although topics relating more generally to American or European governmental institutions and political problems may also be selected.

The attention of students desiring to do graduate work in the various fields of public law is directed to the opportunities open to them in the Law School. The courses in that School in Administrative Law, Constitutional Law, International Law, Jurisprudence, Municipal Corporations, Law of Public Utilities, and Trade Regulations, may be elected by graduate students with the consent of the professors in charge. (See *Announcement of the Law School.*) The members of the faculty of the Law School are willing to cooperate in directing the researches of students in their several fields, and to serve as members of the Special Committees of such students.

1. *American Government.* First term. Three hours a week.

[2. *Comparative Government.* Second term. Three hours a week. Not given in 1942–43.]

3. *State and Local Government.* Second term. Three hours a week.

4. **American Party Politics.** First term. Credit three hours. Dr. TRUMAN. T Th S 12. Boardman 122.

The organization and operation of major and minor political parties in the United States, including nominations, campaign strategy, party leadership and finance, local machines, social and geographic patterns of political allegiance, and the party as a legislative device.

5. **Pressure Politics and Propaganda.** Second term. Credit three hours. Dr. TRUMAN. T Th S 12. Boardman 122.

Types of political pressure groups and their operation, including detailed examination of selected examples; methods of controlling political opinion; the role of interest groups in elections and in the formation and execution of governmental policy.

6. **Municipal Government.** First term. Credit three hours. Dr. HUZAR. M W F 11. Boardman 122.

Urbanization; city-state relations; and politics, organization, finances, and selected functions of city governments. A fee of $1.00 is charged in lieu of a textbook.

7. **Public Administration.** Second term. Credit three hours. Dr. HUZAR. M W F 11. Boardman 122.

Efficiency and responsibility in public administration: principles and problems of administrative organization, the civil service, fiscal management, and methods of administrative action.

9. **Introduction to International Relations.** First term. Three hours a week. Professor BRIGGS. M W F 9. Boardman 110.

A survey of nationalism, internationalism, imperialism, and the racial, political, economic, and geographical factors in modern international relations.

[10. **Recent and Contemporary Political Theory.** First term. Credit three hours. Assistant Professor WATKINS. T Th S 9. Boardman 110. Not given in 1942–43.]

The nature and origins of contemporary political thought, with particular reference to the doctrines of liberalism, communism, and fascism.

[11a. **Comparative Constitutional Government.** First term. Credit three hours. Assistant Professor WATKINS. T Th S 10. Boardman 122. Not given in 1942–43.]

A comparative study of political institutions and processes, as exemplified in the liberal governments of contemporary Europe.

[11b. **Comparative Dictatorial Government.** Second term. Credit three hours. Assistant Professor WATKINS. T Th S 10. Boardman 110. Not given in 1942–43.]

A comparative study of political institutions and processes, as exemplified in the dictatorial governments of contemporary Europe.

14. **International Law.** Throughout the year. Credit three hours a term. Professor BRIGGS. M W F 12. Boardman 320.

The nature and basis of international law; the application of international law in municipal and international courts; the general principles of the law of nations. Cases, readings, and discussions.

16. **Contemporary American Foreign Policy.** Second term. Credit three hours. Professor BRIGGS. M W F 9. Goldwin Smith B.

The Far Eastern and Latin American policies of the United States will be studied in the light of European developments and the emergence of a global foreign policy for the United States.

20. **Constitutional Law: The American Federal System.** First term. Credit three hours. Prerequisite, course 1, course 2 or 3, or the consent of the instructor. Professor CUSHMAN. T Th S 11. Boardman 122.

Judicial interpretation of the constitution: the nature of judicial review; separation of governmental powers; relations between state and national government; construction of national powers.

21. **Constitutional Law: Fundamental Rights and Immunities.** Second term. Credit three hours. Prerequisite, Government 20 or the consent of the instructor. Professor CUSHMAN. T Th S 11. Boardman 122.

Privileges and immunities of citizenship; protection of civil and political rights; the obligation of contracts; due process of law and the equal protection of the law.

Modern Political Theory (See Philosophy 10).

Legal and Constitutional Aspects of Labor Problems (See Economics 46).

28. **American Political and Constitutional Theory.** Second term. Credit two hours. Consult the instructor before registering. Professor CUSHMAN. T Th 9. Boardman.

The background and evolution of American constitutional doctrines.

Local Government (See Agricultural Economics 135).

[**Problems in Financial Administration** (See Agricultural Economics 235). Not given in 1942–43.]

Problems in Public Administration (See Agricultural Economics 236.)

Seminary in Constitutional Problems. Throughout the year. Professor CUSHMAN. Problems of current interest in American Constitutional Law will be selected for individual research. Students will be admitted upon consultation with the instructor.

Seminary in International Law and International Organization. Throughout the year. Professor BRIGGS. Students will be admitted upon consultation with the instructor.

[**Seminary in Contemporary Political Thought.** Throughout the year. Assistant Professor WATKINS. Problems in contemporary political theory. Not given in 1942–43.]

Seminary in Political Theory. Throughout the year. Professor SABINE.

HISTORY

Professors J. P. BRETZ, M. L. W. LAISTNER, CARL STEPHENSON, F. G. MARCHAM, and C. W. DE KIEWIET; *Associate Professors* P. W. GATES, P. E. MOSELY, and KNIGHT BIGGERSTAFF, and *Miss* GUSSIE GASKILL.

Approved Major and Minor Subjects (key to symbols on p. 41)

American History 1, 2, 3, 4
Ancient History 1, 2, 3, 4
English History 1, 2, 3, 4
Far Eastern History 1, 2, 3, 4
Medieval History 1, 2, 3, 4
Modern European History 1, 2, 3, 4

A graduate student in history should have a sufficient knowledge of general history and of geography. He should be able to speak and write good English. He should have a reading knowledge of French, of German, and of any other language necessary for the thorough study of his special subject. For work in Medieval History he would need a knowledge of Latin, and for Ancient History both Latin and Greek. It is highly desirable that he should have had the necessary linguistic training as an undergraduate; but deficiencies in this respect may sometimes be made up after entering upon graduate work.

The University Library contains little short of two hundred thousand volumes dealing with history. It has been from the outset the policy of the University, while providing adequately for the symmetrical growth of the Library, to acquire private collections of books which eminent scholars have through a lifetime of study built up as their tools of research. Thus, for the study of Oriental History, Cornell has been endowed with the EISENLOHR COLLECTION on the history of Egypt, with the WASON COLLECTION on the history and the civilization of China, and with that of President White on the history of Palestine. For the study of the Graeco-Roman world, it acquired that of Charles Anthon. For the Middle Ages, it has notable bodies of books on the birth of the Papal state, on the rise of the Carolingian empire, and in general on the relations of Church and State. For the Renaissance, it can boast the unrivaled FISKE COLLECTIONS on Dante and Petrarch and the world of their time. For the age of the Reformation, for the history of superstition and persecution (notably for Inquisition and Index, for the story of witchcraft, for the beginnings of the sciences, for the rise of tolerance), it is equipped with the riches of the PRESIDENT WHITE LIBRARY; and for the study of the French Revolution that library has no equal on this side of the Atlantic, if anywhere outside of France. For the history of America, the University possesses the library of the historian Jared Sparks, with the MAY COLLECTION on American slavery and the SCAIFE COLLECTION on the Civil War. Professor GOLDWIN SMITH enriched it with his working library of English history; it obtained that of Professor Tuttle on Prussia; from Professor Fiske came one singularly complete on Iceland. In a multitude of other fields it has been found possible to gather for the special student materials for exhaustive research. Many of these collections are endowed with special funds for their increase; and all have been steadily built up with an eye to the needs of the mature student of history.

Three fellowships and a scholarship are annually awarded to graduate students of history. The President White Fellowship in Modern History has a value of $500. It may be granted as a travelling fellowship. The fellowship in American History amounts to $400. The stipend of the George C. Boldt Fellowship in history is $1,000. The Graduate Scholarship in History amounts to $200. Holders of fellowships and graduate scholarships are, with the exception of the Boldt Fellowship, exempt from the payment of tuition. There are several assistantships in history, which are filled preferably by the appointment of graduate students.

Fellowships are ordinarily awarded only to applicants who have had one year or more of graduate study. It will hardly be worth while for persons who have not had a year of graduate study to apply unless they can submit written work of superior quality.

A seminary is conducted in each of the major fields of history and each professor is willing to direct research in his special field.

General courses are offered in ancient, medieval, modern European, and English history, and in American history both political and economic. These are intended for undergraduates, but, if supplemented by individual work, one or another of them may sometimes serve the purposes of a graduate student.

AMERICAN HISTORY

Professor J. P. BRETZ and *Associate Professor* P. W. GATES.

82. *American History*, 1607–1850.
83. *American History*, 1850–1936.
86. *American History*, 1787–1848.
87. *American History*, 1848–1914.

89. **American History, 1750-1848:** The Settlement of the Middle West. Second term. Two hours a week. Prerequisites, History 82, 83, or the equivalent Professor BRETZ. T Th 9. Boardman 321.

91. **Recent American History.** First term. Prerequisites, History 82, 83 or 86, 87, or the equivalent. Associate Professor GATES. M W F 12. Boardman 321.

[92. **American Colonial History.** First term. Associate Professor GATES. M W F 12. Boardman 321. Not given in 1942–43.]

[93. **Economic History of the United States.** Second term. Associate Professor GATES. M W F 12. Boardman 321. Not given in 1942–43.]

99. **Seminary in American History.** Second term. Two hours a week. Professor BRETZ. Hours to be arranged.

100. **Seminary in American History.** First term. Two hours a week. Associate Professor GATES. Hours to be arranged.

ANCIENT HISTORY

Professor M. L. W. LAISTNER.

1. *Outlines of Ancient History.* Throughout the year. Three hours a week.
3. **Greek History,** 500–323 B.C. First term. M W F 11. Boardman 321.
4. **The Hellenistic Age.** Second term. M W F 11. Boardman 321.

[5. **The Roman Republic,** 133–30 B.C. First term. Boardman 321. Not given in 1942–43.]

[6. **The Roman Empire,** 30 B.C.–180 A.D. Second term. Boardman 321. Not given in 1942–43.]

8. **Seminary in Greek and Roman Historiography.** Throughout the year. M 2–4. Boardman 222.

[14. **Seminary in Roman Historical Inscriptions.** Throughout the year. M 2–4 University Library, Classical Seminary. A reading knowledge of Latin is essential. Not given in 1942–43.]

ENGLISH HISTORY

Professor F. G. MARCHAM.

61. *English History.*

[65. **English Constitutional History since 1485.** Throughout the year. Not given in 1942–43.]

66a and b. *History of England under the Tudors and Stuarts.* Throughout the year. Three hours a week.

[67 and 68. *History of England from the Eighteenth Century to Present.* Throughout the year. Three hours a week. Not given in 1942–43.]

69. **Seminary in Tudor and Stuart History.** Throughout the year.
Study of materials for research in Tudor and Stuart history and some of the leading historical problems of the period.

FAR EASTERN HISTORY

Associate Professor KNIGHT BIGGERSTAFF and *Miss* GUSSIE GASKILL.

15. **Chinese History.** Throughout the year. Associate Professor BIGGERSTAFF.

18a and b. **Modern History of the Far East, 19th and 20th Centuries.** Throughout the year. Associate Professor BIGGERSTAFF. M W F 12. Boardman 121.
A study of the political, social, and economic background of international relations in Eastern Asia.

20. **Seminary in Modern Chinese History.** Throughout the year. Associate Professor BIGGERSTAFF and Miss GASKILL.

Medieval History

Professor Carl Stephenson.

21. *Medieval History.*

[22. **The Rise of the Universities.** First term. T Th 10. Boardman 226. Not given in 1942–43.]

23. **Social and Economic History of the Middle Ages.** Second term. T Th 10. Boardman 226.

24. **English Constitutional History to 1485.** First term. T Th 10. Boardman 226.

26. **Seminary in Medieval History.** Throughout the year. Prerequisite, reading knowledge of Latin; German and French desirable. Hours to be arranged.

Modern European History

Professor C. W. de Kiewiet and *Associate Professor* P. E. Mosely.

42. *Modern History,* 1600–1870.
50. *Recent European History,* 1870–1938.

43. **France in the 17th and 18th Centuries.** Throughout the year. Professor de Kiewiet.

[51. **The History of Russia.** Throughout the year. Associate Professor Mosely. M W F 11. Boardman 320. Not given in 1942–43.]

52. **Modern History of the Balkans and Near East.** First term. Associate Professor Mosely.

53. **Modern History of the German People.** Second term. Associate Professor Mosely. T Th S 11. Boardman 320.

Seminary in Modern European History. Professor de Kiewiet. Hours to be arranged.

Seminary in Recent European History. Associate Professor Mosely. Hours to be arranged.

SOCIOLOGY

Sociology and Anthropology; Rural Sociology

Professors Dwight Sanderson, L. S. Cottrell, jr., W. A. Anderson, F. F. Stephan, J. L. Woodward, and R. L. Sharp; *Doctor* Philipp Weintraub and Louis Guttman.

Approved Major and Minor Subjects (key to symbols on p. 41)

Sociology 1, 2, 3, 4
Rural Sociology 1, 2, 3, 4
Anthropology 2, 3, 4
Statistics 2, 3, 4

Requirements for the Degree of Ph.D.

Note. If the major for the Ph.D. degree lies in either of the first two fields, not more than one of the other two may be selected as a minor.

General Sociology. When offered as a major for the Ph.D. degree: (1) a thorough knowledge of the field of sociological theory and its history; (2) a thorough knowledge of the methodology of sociological research; and (3) a detailed knowledge of at least three of the following sub-fields in sociology: criminology, social psychology, population, social pathology, urban sociology, rural sociology, the family, educational sociology, sociology of law, social anthropology, statistics.

When offered as a minor for the Ph.D. degree: a general knowledge of part (1) of the above requirement and a satisfactory knowledge of one or two sub-fields.

Rural Sociology. When offered as a major for the Ph.D. degree: (1) a thorough knowledge of the field of sociological theory and its history; (2) a thorough knowl-

edge of the methodology of sociological research; (3) a thorough knowledge of rural sociology and of the research in this field; and (4) a detailed knowledge of at least two of the following sub-fields in sociology: social psychology, population, the family, educational sociology, social anthropology, urban sociology, social pathology, criminology.

When offered as a minor: a general knowledge of parts 1 and 3 of the above requirement, and a satisfactory knowledge of one or two of the sub-fields under part 4.

Graduate students who desire to major in rural sociology should have had a considerable personal experience with rural life and rural institutions, and a knowledge of sociology, psychology, and economics. Introductory courses in general sociology, rural sociology, and economics are prerequisite to graduate courses.

Anthropology. When offered as a minor for the Ph.D. degree, the requirements are substantially the equivalent of the major requirements for the A.M. degree.

Statistics. When offered as a minor for the Ph.D. degree: (1) the completion of an approved sequence of courses including a full year in Sociology 172; (2) completion of a research project which demonstrates that the candidate is able to select methods appropriate to the problem and to employ advanced statistical methods.

Requirements for the Degree of A.M. or M.S.

General Sociology and Rural Sociology. Graduate students offering General Sociology or Rural Sociology as a major or minor for the master's degree should consult the professors concerned to ascertain the exact requirements. In general, the major requirements for the master's degree are substantially the equivalent of the minor requirements for the Ph.D. degree.

Anthropology. When offered as a major: (1) a general knowledge of the factual, theoretical, and methodological contributions of anthropology to the historical and comparative study of man and his behavior; (2) a more detailed knowledge of the field of cultural anthropology with special emphasis upon ethnology, including the archaeology and ethnography of some one continental area, and social anthropology, including the analysis and comparison of particular cultures. When offered as a minor: Part (1) of above requirement.

Statistics. When offered as a major, the requirements are the same as for the minor for the Ph.D. degree. When offered as a minor, either part (1) or part (2) of the requirements for the Ph.D. degree.

The following courses are offered in the departments of Sociology and Anthropology (SA) and Rural Sociology (RS) as indicated:

GENERAL SOCIOLOGY

SA2. *Introduction to Sociology.* Either term. Three hours a week.

RS1. *General Sociology.* Either term. Three hours a week.

SA3. *Man and Culture.* Second term. Credit three hours. Professor SHARP. M W F 10. McGraw 201.

SA10. *The Family.* First term. Credit three hours. Professor COTTRELL. T Th S 8. McGraw 201.

SA20. *Social Pathology.* Second term. Credit three hours. Professor WOODWARD. T Th S 11. McGraw 201.

SA21. *Criminology.* First term. Credit three hours. Professor WOODWARD. T Th S 11. McGraw 201. Given in 1942–43 and alternate years.

Social Psychology. Throughout the year. Credit three hours a term. Prerequisite, permission of the instructors. Professor COTTRELL (Sociology) and Professor WHITE (Psychology). T Th S 10. McGraw 201. Fee for materials, $2 each term.

An interdepartmental course. Given in place of courses formerly listed as: Psychology 9 and 10 and Sociology and Anthropology 30. Terms may be elected separately.

SA35. **Culture and Personality.** First term. Credit two hours. Prerequisites, Sociology and Anthropology 60 and Social Psychology or the permission of the instructors. Professor COTTRELL and Professor SHARP. Th 2–4. McGraw 205b.

A comparative study of the development and functioning of human personality in various cultures. The study is made from the points of view of social psychology and social anthropology.

[SA40. **Population Problems.** First term. Credit three hours. Professor WOODWARD. Given in alternate years. Not given in 1942–43.]

[SA45. **Statistical Study of Society.** First term. Credit three hours. Professor STEPHAN. Not given in 1942–43.]

SA50. **Systematic Sociology.** First term. Credit three hours. Prerequisite, Sociology 2 or equivalent. Dr. WEINTRAUB. T Th 12 and one hour to be arranged. McGraw 205b.

Basic concepts of sociology. Structure and organization of society. Society as process. Social differentiation. Social typology. Relation of sociology to other social sciences.

SA70. *Introduction to Statistics.* Second term. Credit three hours. Open to sophomores, juniors, and seniors; enrollment limited to fifty. Mr. GUTTMAN. M W F 11. McGraw 201.

A descriptive course on elementary principles and methods for the systematic collection, presentation, and interpretation of statistics. For students who desire only one course in statistics, this course will provide an acquaintance with the principal source of statistics, a knowledge of the major uses of statistics, and a critical understanding of elementary methods of analysis and statistical reasoning.

SA71. **Methods of Statistical Analysis.** Throughout the year. Credit four hours a term. Prerequisites: for the First term, Mathematics 65a, 30, or equivalent, or enrollment therein; for the Second term, Mathematics 65b or equivalent, or enrollment therein. Mr. GUTTMAN. M W F 9, and *one* of the following laboratory periods: T 2–4, F 2–4. McGraw 301.

The analysis of frequency distributions of qualitative and quantitative variables: graphic representation, averages, dispersion, sampling and tests of significance, analysis of variance, regression, correlation, elementary multivariate analysis—including the problem of index numbers in economics and of scale construction in sociology and psychology. Fee for materials, $2 each term.

[SA110. **Seminar: Research in the Family.** Second term. Credit two hours. Professor COTTRELL. Not given in 1942–43.]

[SA130. **Seminar: Research in Social Psychology.** First term. Credit two hours. Prerequisite, permission of instructor. Professor COTTRELL. Given in alternate years. Not given in 1942–43.]

SA150. **Seminar in Social Theory.** Second term. Credit two hours. Dr. WEINTRAUB. T 2–4. McGraw 205b.

Topic for 1942–43: Social Stratification.

[SA156 and RS218. **Seminar: Research Methods in Sociology.** First term. Credit two hours. Professors SANDERSON and COTTRELL. Not given in 1942–43.]

SA172. **Seminar: Advanced Statistical Methods.** Throughout the year. Credit two hours a term. Prerequisite, course 71 or equivalent; Mathematics 400 is recommended. Mr. GUTTMAN. W 2–4. McGraw 301.

The topic or topics for the seminar will be decided by a consensus of the students. The theory of statistical inference (fundamental sampling problems), multiple factor analysis, reliability and validity of scales, the theory of statistical prediction, and other topics are among those that might be chosen.

RS207. **Sociological Theory.** Throughout the year. Credit three hours a term. T Th S 9. Warren Hall 302. Professor ANDERSON. Given in alternate years.

A course devoted to the critical analysis of sociological theories from the time of August Comte to those of present day sociologists.

[RS208. **Systematic Sociology.** Throughout the year. Credit three hours a term. Professor ANDERSON. Given in alternate years, not given 1942–43.]

RS209. **Seminar.** Second term. Credit two hours. Professor SANDERSON. F 2–4. Warren Hall 302. Given in alternate years.

The structural characteristics and classification of different types of social groups as related to their functions will be studied.

ANTHROPOLOGY

SA60. *Social Anthropology.* Throughout the year. Credit three hours a term. Profesor SHARP. M W F 12. McGraw 201.

SA64. *Cultures of Asia.* First term. Credit three hours. Prerequisites, Sociology and Anthropology 3 or consent of instructor. Professor SHARP. M W F 10. McGraw 201.

A study of the primitive cultures of representative ethnic groups in eastern Asia, including India and Indonesia, their origins, diffusions, content, and relationships with the great civilizations of this area.

[SA65. *The American Indian.* First term. Credit three hours. Prerequisite, permission of the instructor. Professor SHARP. M W F 10. McGraw 201. Given in alternate years, not in 1942–43.]

SA68. *Physical Anthropology and Human Evolution.* Second term. Credit three hours. Professor PAPEZ and instructors. M W F 11. (See Zoology 223).

SA160. **Seminar in Anthropology.** Throughout the year. Credit two hours a term. Prerequisite, permission of the instructor. Professor COTTRELL and Professor SHARP. Hours to be arranged.

Topic for 1942–43: Problems in the study of comtemporary American community cultures.

RURAL SOCIOLOGY

RS1. *General Sociology.* Either term. Three hours a week.

RS12. *Rural Sociology.* Either term. Credit four hours.

RS111. **Rural Community Organization.** Second term. Credit three hours. Prerequisites, courses 1 and 12 or the permission of the instructor. Professor SANDERSON. Lectures and discussions. T Th S 10. Warren 302.

The application of sociology to the practical problems of community organization. The course covers three main divisions: the use of community organization as a tool for guiding social change; a critical study of rural community organizations; methods of making organizations effective through developing rural leadership, analyzing community needs, building community programs, and coordinating programs.

RS112. *Rural Recreation.* Second term. Credit two hours.

RS123. *Social Work Practice.* Throughout the year.

RS124. **Social Case Work I.** First term. Credit three hours. Prerequisite, course 1, one course in psychology, and Sociology 10, or equivalent. M W F 9. Warren 340. Miss STRODE.

An introduction to the history, principles, and practice of social case work in public and private welfare agencies, including an analysis of the case-study method and the use and development of social resources. Fee for materials, $1.

RS125. **Social Case Work II.** Second term. Credit three hours. Prerequisite, course 124. M W F 9. Warren 340. Miss STRODE.

Study of social work practice and procedures in public welfare agencies with special reference to case material from rural areas.

RS126. **Social Skills in Case Work.** First term. Credit three hours. Prerequisite, course 124. M W F 8. Warren 340. Miss STRODE.

Analysis of the social skills that are essential equipment for the case worker. Research to illustrate their functioning and projects to aid the student in acquiring facility in their use.

RS132. **Rural Leadership.** Second term. Credit two hours. Prerequisite, course 1. Professor SANDERSON. Th 2–4. Warren 302.

A seminar course in which rural leadership is studied from both sociological and psychological points of view.

RS133. **Group Leadership.** Second term. Credit three hours. Extension Assistant Professor DUTHIE. M W 12, and hour to be arranged. Warren 302.

A consideration of the factors involved in group formation, the relationships of the leader to the group, and the group members to each other. The place of the program in group work and the process of program formation are described, with special reference to work with 4-H Clubs, Scouts, and juvenile groups. Practice in leadership or an acceptable equivalent will be required. (This may be satisfied by taking course 123 at the same time.)

RS211. **The Rural Community.** First term. Credit two hours. Prerequisites, courses 1 and 12 or their equivalent. Professor SANDERSON. F 2–4. Warren 302.

RS212. **Rural Sociology.** First term. Credit four hours. Prerequisite, course 1. Lectures, discussions, and special reports. Professor SANDERSON. T Th S 11, and one hour to be arranged. Warren 325. This is the same as course 12, with one hour discussion period for graduate students only.

A study of the groups, organizations, and institutions found in rural society, their structure and function, and a consideration of the means for the improvement of rural social organization.

RS213. **Research in Rural Social Organization.** Throughout the year. Hours and credits to be arranged. Professors SANDERSON, ANDERSON, and COTTRELL.

RS217. **Seminar in the History of Research in Rural Sociology.** Second term. Credit three hours. Professor ANDERSON. M W F 10. Warren 302.

ANIMAL SCIENCES

NOTE—*Laboratory space is limited and is often overtaxed, especially in courses which admit both graduate students and undergraduates. Graduate students who desire to enroll in such courses are warned to make application for space well in advance of the beginning of instruction. This holds particularly of the second term, since the College of Agriculture holds its preregistration for undergraduates in January. Failure to arrange for laboratory space in advance will probably result in exclusion from courses.*

Graduate work in Animal Sciences at Cornell University is distributed through many Departments in the Colleges of Agriculture, Arts and Sciences, and Veterinary Medicine. In this *Announcement* little cognizance is taken of college or departmental organization. The various fields of study in which students may elect to pursue their work, for the Master's or Doctor's degree are listed alphabetically. After selecting his major field the student should consult the professor in charge (who may become chairman of his special committee) as to the most appropriate minor field or fields. The requirements in each field depend largely on the previous training of the student, and the professor in charge will outline the courses of study and the nature of the thesis or essay that will be required. In each case, however, a candidate for an advanced degree will be expected to have had adequate undergraduate training in the fields in which he plans to specialize.

The laboratory and field equipment and the library facilities available to graduate students in the Animal Sciences at Cornell are those of a major university where the members of the faculty are engaged in research. Each department has its special facilities in keeping with the nature of the research undertaken, and all enjoy a large central library as well as smaller departmental libraries. Since so many departments and buildings on the campus are involved, attention is called in the alphabetical arrangement to the location of the main office of each field of work.

In some fields, work during the summer, either in the Summer Session or under Personal Direction, is permitted.

In certain fields there are a limited number of temporary fellowships for special work. In the general field of Animal Biology there is one fellowship with a stipend of $400 and a scholarship with a stipend of $200, each of which carries free tuition. One of the Henry Strong Denison Fellowships in Agriculture is awarded in the field of animal sciences. This fellowship has a stipend of $1,000, but does not carry free tuition. The fellowships and the scholarship are awarded annually.

In the Department of Psychology the Sage Fellowship is usually awarded to a candidate who has completed at least two years of graduate study; the Sage Scholarship to first-or second-year graduates.

Approved major and minor subjects are listed under the respective fields; the key to the numbers will be found on page 41.

ANIMAL BREEDING

Rice Hall; *Professors* F. B. Hutt, S. A. Asdell, G. O. Hall, A. L. Romanoff, G. W. Salisbury, J. H. Bruckner, W. F. Lamoreux, and R. K. Cole.

Approved Major and Minor Subjects (key to symbols on p. 41)

Animal Breeding 1, 2, 3, 4

Before entering upon graduate work the student should have had courses in general biology or zoology, comparative anatomy, animal or human physiology, organic and inorganic chemistry. For students in the Department of Poultry Husbandry some training or experience in that field is necessary.

The following courses are offered in the Departments of Animal Husbandry (A.H.), Poultry Husbandry (P.H.), and Plant Breeding (P.B.), as indicated. Students are expected to take certain courses in animal physiology, embryology,

cytology, and histology, and are usually advised to select at least one of these subjects for their minor requirements.

P.H. 20. *Poultry Breeds, Breeding, and Judging.* First term. Credit three hours.

P.H. 30. *Poultry Incubation and Brooding.* Second term. Credit two hours.

A.H. 20. *Animal Breeding.* First term. Two lectures and one laboratory a week.

P.B. 101. *Genetics.* First term. Credit four hours.

P.B. 201. **Advanced Genetics.** Second term. Prerequisites, course 101 and Botany 124. Professor ————. M F 8–10. Plant Science 146. Laboratory work to be arranged. Laboratory fee, $3; deposit, $2.

Group discussions of advanced principles of genetics, with special attention to methods of analysis as illustrated in problems on both hypothetical and experimental data. Laboratory studies on the artificial production of mutations in Drosophila by means of X-rays, with as complete a genetic analysis of these as time permits.

P.B. 211. **Statistical Methods of Analysis.** First term. Associate Professor LIVERMORE. Th 1:40–4. Plant Science 233. Laboratory fee, $2.

A discussion of statistical methods for the study of variation, correlation, curve fitting, experimental error, the analysis of variance and covariance; and the application of these methods to problems in biology and related fields.

[A.H. 120. **Problems in Animal Breeding.** First term. Prerequisite, Animal Husbandry 20 or Plant Breeding 101. Associate Professor SALISBURY. T Th 11. Wing E. Given in alternate years, not in 1942–43.]

A consideration of the problems involved in the improvement of the larger farm animals and the application of genetics in their solution.

A.H. 125. **Endocrinology, Reproduction, and Lactation.** Second term. Prerequisite, a course in human or veterinary physiology. Credit two hours. Professor ASDELL. M W 10. Wing A.

A general course in endocrinology, with more detailed consideration of the endocrine processes involved in reproduction and lactation.

A.H. 126. **Problems in Animal Physiology.** First term. Registration by permission. Professor ASDELL. Times to be arranged. Given in alternate years.

Assigned reading and conferences on growth, reproduction, and lactation in mammals.

[P.H. 120. **Poultry Genetics.** Second term. Credit two hours. Prerequisites, Zoology 1, Plant Breeding 101, and permission of the instructor. Professor HUTT. W F 8. Rice 305. Given in alternate years, not in 1942–43.]

Inheritance in domestic birds, the application of genetic principles to poultry breeding, disease resistance, hybrid vigor, cytology, sex and secondary sex characters.

[P.H. 121. **Physiology of Avian Reproduction.** Second term. Credit two hours. Prerequisites, Zoology 1, a course in animal physiology, and permission of the instructor. Lecture, M 8. Laboratory, M 1:40–4. Assistant Professor LAMOREUX. Given in alternate years, not in 1942–43.]

Gross and microscopic anatomy of the reproductive organs of birds and their functions, with special reference to the fowl. Gametogenesis, fertilization, infertility and embryonic mortality, sex differentiation, and the functions of the endocrine glands.

P.H. 220. **Animal Genetics.** First term. Prerequisites, Plant Breeding 101 and permission of the instructor. Professor HUTT. Not given every year and not unless five or more students wish to take the course.

Assigned readings and conferences on inbreeding, hybridization, disease resistance, lethal genes, genetic sterility, sex, heredity in laboratory animals, domestic animals and man, sire indices, and other topics. Designed to acquaint the student with the literature and methods of research in animal genetics.

P.H. 229. **Seminar in Animal Breeding.** First and second terms. Professors HUTT, ASDELL, and staff. Th 4:15. Rice 201.

Discussion of current literature and special topics of interest to workers in this field.

ANIMAL DISEASES

Veterinary College; *Professors* W. A. HAGAN, PETER OLAFSON, E. L. BRUNETT, ALEX ZEISSIG, C. W. BARBER, P. P. LEVINE, R. R. BIRCH, H. L. GILMAN, D. W. BAKER, J. N. FROST, A. G. DANKS, H. J. MILKS, H. C. STEPHENSON, D. H. UDALL, M. G. FINCHER, W. J. GIBBONS, and S. J. ROBERTS.

(See under VETERINARY MEDICINE, p. 191)

ANIMAL HUSBANDRY

Wing Hall; *Professors* F. B. MORRISON, E. S. SAVAGE, L. A. MAYNARD, C. M. MCCAY, E. S. HARRISON, S. A. ASDELL, R. B. HINMAN, G. W. SALISBURY, J. P. WILLMAN, and J. I. MILLER.

Animal Husbandry 1, 2, 3, 4 (See under AGRICULTURE, p. 130)

ANIMAL NUTRITION

Dairy Building; *Professors* L. A. MAYNARD, C. M. MCCAY, L. C. NORRIS, S. A. ASDELL, F. B. MORRISON, E. S. SAVAGE, G. F. HEUSER, L. L. BARNES, J. K. LOOSLI, and G. H. ELLIS.

Approved Major and Minor Subjects (key to symbols on p. 41)

Animal Nutrition 1, 2, 3, 4

(See also Foods and Nutrition 1, 2, 3, 4; Martha Van Rensselaer Hall, *Professors* HELEN MONSCH, MARION PFUND, HAZEL HAUCK, FAITH FENTON, L. A. MAYNARD, and C. M. MCCAY, under HOME ECONOMICS, page 180)

In order to enter upon graduate study in animal nutrition as a major field the student should have had courses in general biology or zoology, introductory chemistry, analytical chemistry, organic chemistry, human or animal physiology, physics, and animal breeding or genetics. In the course of their graduate study candidates for the doctor's degree are expected to acquire training in biochemistry, physiology, histology, physical chemistry, and biometry, and are generally advised to select one of these fields as a minor.

The following courses are offered in the departments of Animal Husbandry (A.H.) and Poultry Husbandry (P.H.), as indicated:

A.H. 10. *Livestock Feeding.* First or second term. Three lectures and one laboratory period a week.

P.H. 110. *Poultry Nutrition.* Second term. Two lectures and one laboratory period a week.

A.H. 110. **Principles of Nutrition.** First term. Prerequisites, a course in physiology and in organic chemistry. Professors MAYNARD and LOOSLI. Lectures, M W F 10. Wing B.

The chemistry and physiology of nutrition and the nutritive requirements for growth, reproduction, lactation, and other body functions.

A.H. 111. **Laboratory Work in Nutrition.** Must be preceded by or accompanied by course 110. Registration by permission. Professor MCCAY. M W F 1:40–4. Dairy Industry Building 160. Laboratory fee, $10; breakage deposit, $5.

This course is designed to familiarize the student with the application of chemical methods to the solution of fundamental problems of nutrition.

A.H. 213. **Biochemistry of Lactation.** Second term. Prerequisite, A.H. 110. Professors MAYNARD and LOOSLI. One meeting a week at an hour to be arranged. Given in alternate years.

A discussion of the biochemistry of the processes involved in milk secretion and of the composition of milk as related to diet and to the blood precursors.

P.H. 210. **Experimental Methods in Poultry Nutrition.** First term. Registration by permission. Professor NORRIS. Discussion and laboratory period, W 1:40–5. Rice. Given if desired by a sufficient number of students. Not given every year. Laboratory fee, $5.

A critical consideration of the domestic fowl as an experimental animal and of the experimental methods used in conducting research projects in poultry nutrition.

[A.H. 214. **Special Topics in Animal Nutrition.** Prerequisites, A.H. 110 and Biochemistry 314. Professors MAYNARD and LOOSLI. One meeting a week at an hour to be arranged. Given in alternate years, not in 1942–43.]

A presentation and discussion of the knowledge and techniques of special fields of animal nutrition.

A.H. 215. **History of Nutrition.** First term. Prerequisites, A.H. 110 and permission to register. Professor MCCAY. One meeting a week at an hour to be arranged. Dairy Industry Building 160.

Lectures and conferences on the nutrition of animal species from the invertebrates to man, with special emphasis upon the fundamental discoveries in such fields as growth, comparative biochemistry, and physiology that have been synthesized into the modern science of nutrition.

219. **Seminar in Animal Nutrition.** First and second terms. Registration by permission. Professors MAYNARD, MCCAY, NORRIS, and HAUCK. Weekly conferences, M 4:15. Dairy Industry Building 160.

A consideration of the experimental data on which the principles of animal nutrition are based, and a critical review of current literature.

ANIMAL PATHOLOGY

Moore Laboratory; *Professors* W. A. HAGAN, PETER OLAFSON, E. L. BRUNETT, and A. ZEISSIG.

Animal Pathology 1, 2, 3, 4 (See under VETERINARY MEDICINE, p. 191)

ANTHROPOLOGY

McGraw Hall; *Professor* R. L. SHARP.

Anthropology 2, 3, 4 (See under SOCIOLOGY, p. 76)

APICULTURE

Comstock Hall; *Professor* E. F. PHILLIPS.

Apiculture 1, 2, 3 (See under ENTOMOLOGY, p. 82)

BIOLOGICAL CHEMISTRY

Dairy Building; *Professor* SUMNER and *Doctor* SOMERS.

Approved Major and Minor Subjects (key to symbols on p. 41)

Biochemistry 1, 2, 4

314. *Biochemistry for Undergraduates.* First term. Three lectures a week.

314a. *Biochemistry Laboratory for Undergraduates.* First term. Two afternoons a week.

316. *Food Chemistry and Nutrition.* First term. Credit two hours.

317. *Food Processing and Nutrition.* Second term. Credit two hours.

320. **Biochemistry, Advanced Lecture Course.** First term. Credit three hours. Prerequisites, one term of Chemistry 305 and one term of Chemistry 310, or the equivalent, including introductory courses in qualitative and quantitative analysis. Professor SUMNER and Dr. SOMERS. Lectures, M W F 9–10. Dairy Building 218.

The biological and physical chemistry of lipids and carbohydrates.

321. **Biochemistry, Advanced Laboratory Course.** First term. Credit two hours. Prerequisite, or parallel, course 320 or 322. Professor SUMNER and Dr. SOMERS. Laboratory, M W 1:40–4. Dairy Building 175. Laboratory fee, $15; breakage deposit, $5.

Laboratory experiments with lipids and carbohydrates.

322. **Biochemistry, Advanced Lecture Course.** Second term. Credit three hours. Prerequisites, one term of Chemistry 305 and one term of Chemistry 310, or the equivalent, including introductory courses in qualitative and quantitative analysis. Professor SUMNER and Dr. SOMERS. Lectures, M W F 9–10. Dairy Building 218.

The biological and physical chemistry of proteins, enzymes, and related substances.

323. **Biochemistry, Advanced Laboratory Course.** Second term. Credit two hours. Prerequisite, or parallel, course 320 or 322. Professor SUMNER and Dr. SOMERS. Laboratory, M W 1:40–4. Dairy Building 175. Laboratory fee, $15; breakage deposit, $5.

Laboratory experiments with proteins and enzymes.

324. **Biochemistry Seminar.** First and second terms. Credit one hour. Registration by permission. Professor SUMNER and Dr. SOMERS. Hours to be arranged. Dairy Building.

Discussion of new research articles, recent books, and new developments.

325. **Biochemistry, Research Work.** Throughout the year. Prerequisites, courses 321 to 323 inclusive. Professor SUMNER and Dr. SOMERS. Laboratory hours to be arranged. Dairy Building 175. Laboratory fee, $3 a credit hour; breakage deposit, $5.

CYTOLOGY

Plant Science Building; *Professor* L. W. SHARP.

Cytology 1, 2, 3, 4 (See under PLANT SCIENCES, p. 96)

DAIRY SCIENCE

Dairy Building; *Professors* J. M. SHERMAN, H. E. ROSS, P. F. SHARP, B. L. HERRINGTON, E. S. GUTHRIE, W. E. AYRES, H. J. BRUECKNER, D. B. HAND, and *Doctor* V. N. KRUKOVSKY; at Geneva, A. C. DAHLBERG, D. C. CARPENTER, J. C. HENING, and J. C. MARQUARDT.

Dairy Science 1, 2, 3, 4 (See under AGRICULTURE, p. 131)

ECOLOGY

Comstock Hall; *Professor* PALM and *Associate Professor* MOTTLEY.

Insect Ecology 1, 2, 3 (See under ENTOMOLOGY, p. 83)

Limnology 1, 2, 3, 4 (See under LIMNOLOGY AND FISHERIES, p. 86)

Stimson Hall; *Professors* A. H. WRIGHT and W. J. HAMILTON, JR.

Ecology 1, 2, 3, 4 (See under ZOOLOGY, p. 92)

ENTOMOLOGY

Comstock Hall; *Professors* W. E. BLAUVELT, J. C. BRADLEY, D. L. COLLINS, R. W. LEIBY, ROBERT MATHESON, C. M. MOTTLEY, C. E. PALM, E. F. PHILLIPS, P. A. READIO, T. R. HANSBERRY, H. H. SCHWARDT, L. B. NORTON, and W. A. RAWLINS; and *Doctors* F. H. BUTT, W. T. M. FORBES, R. L. PATTON, and T. C. WATKINS; at Geneva, *Professors* P. J. CHAPMAN, D. M. DANIEL, H. GLASGOW, F. Z. HARTZELL, and P. J. PARROTT.

Approved Major and Minor Subjects (key to symbols on p. 41)

Apiculture 1, 2, 3
Insect Ecology 1, 2, 3
Economic Entomology 1, 2, 3
Insect Embryology 1, 2, 3
Entomology 4
Limnology 1, 2, 3
Medical Entomology 1, 2, 3
Insect Morphology and Histology 1, 2, 3
Parasitology 1, 2, 3
Insect Physiology 1, 2, 3
Insect Taxonomy 1, 2, 3
Insect Toxicology 1, 2, 3

In order to undertake graduate study the student should not only be prepared in the fundamentals of Animal Biology but also have or acquire a foundation in

the particular phase of this subject which he intends to pursue and should have a reading knowledge of French and German.

In the summer, members of the staff are prepared to direct the research of graduate students in connection with the Summer Session of Cornell University.

Undergraduate courses 12, 15, 30, 41, 122, 131, and either 185 or 16, are accounted a part of a preparation for graduate study in entomology:

12. *General Entomology.* First term. Credit three hours.

15. *Wing Venation and Evolution.* Second term. Credit one hour.

30. *Taxonomy of Insects.* Second term. Credit two hours.

122. *Insect Morphology, Anatomy, and Histology.* Throughout the year. Credit three hours a term.

131. *The Phylogeny and Classification of Insects.* First term. Credit four hours.

185. *Insect Physiology.* First term. Credit three hours.

16. *Insect Ecology.* First term. Credit three hours.

41. *General Economic Entomology.* Second term. Credit three hours.

Course 61 is also recommended for certain phases of the work.

61. *General Beekeeping.* Second term. Credit three hours.

Descriptions of the above courses will be found in the *Announcement of the College of Agriculture.*

16. **Insect Ecology.** First term. Credit three hours. Prerequisites, Biology 1 or Zoology 1, and Entomology 12. Professor PALM. Lecture, T Th 9. Comstock 145. Laboratory, Th 1:40–4. Comstock 110. Laboratory fee, $3.50.

A general study of insects in relation to their environment. Attention is given to life-history studies in the field and insectary; the role that insects play in different natural associations; the relations between structure, instinct, habitat, and ways of living. Photographing insects in the field and laboratory is included as a part of the course.

122. **Insect Morphology, Anatomy, and Histology.** Throughout the year. Credit three hours a term. Prerequisite, course 12. Dr. BUTT and Mr. METCALF. Lecture, T 10. Comstock 145. Laboratory, M W 1:40–4:00. Comstock 270. Laboratory fee, $3.

A thorough study of external and internal anatomy of insects. Laboratories will include gross dissection and histological studies of internal organs of representative insects.

123. **Insect Embryology and Post Embryonic Development.** Second term. Credit two hours. Prerequisites, courses 12 and 122. Dr. BUTT. Lecture and laboratory, hours by appointment. Comstock 270. Laboratory fee, $3.

Lectures with assigned reading and reports by students.

124. **Insect Histology.** Technique. First or second term. Credit two hours. Prerequisites, courses 12 and 122. Dr. BUTT. Two laboratories a week by appointment. Comstock 265. Laboratory fee, $3.

The technique of preparing, sectioning, and mounting insect tissues for study.

241. **Advanced Economic Entomology.** Second term. Credit three hours. Prerequisite, course 41. Professor READIO. Lecture, M 11. Comstock 145. Laboratories, F 1:40–4 and S 8–10:30.

A course for the student intending to work in the field of economic entomology. The lectures consist of discussions of the principles and methods of insect control; the laboratories consist of practical exercises in the use of materials and methods of insect control in the orchard, vegetable garden, and greenhouse.

51. **Parasites and Parasitism.** Second term. Credit two hours. Prerequisite, Biology 1 or Zoology 1. Professor MATHESON, Mr. BELKIN, and Mr. REHN. Lecture, Th 9. Comstock 245. Practical exercises, Th or F 1:40–4. Comstock 200. Laboratory fee, $2.

A consideration of the origin and biological significance of parasitism, and of the structure, life, and economic relations of representative parasites.

[52. **Medical Entomology.** Second term. Credit two hours. Prerequisite, Zoology 1 or Biology 1. Professor MATHESON, Mr. BELKIN, and Mr. REHN. Lecture, T 9. Comstock 245. Practical exercises, T or W 1:40–4. Comstock 200. Laboratory fee, $2. Not given in 1942–43.]

This course deals with insects and other arthropods that are the causative agents of disease in man and animals, or are the vectors, or intermediate hosts, of disease-producing organisms.

261. **Advanced Beekeeping.** First and second terms. Credit four hours a term. Professor PHILLIPS. M F 11–12:50. Comstock 17.

A technical course covering investigations, especially those of a scientific character, in all phases of apiculture. Special consideration is given to the study of beekeeping regions, with particular reference to conditions in New York.

Designed for advanced students preparing to teach or to do research in apiculture.

117. **Entomological Aspects of Biological Problems.** First term. Credit one hour. Doctor FORBES. Lecture, M 10. Comstock 145.

A review of the contributions of entomology to the study of certain more general biological problems, such as distribution, coloration, relation to environment, and the question of species. Some consideration is given also to the history of entomology and to museums, explorations, and other means that are used in its development.

118. **The Techniques of Biological Literature.** First term. Credit three hours. Professor BRADLEY. Lectures, M F 11. Comstock 300. Library work by assignment.

A critical study of the biologists' works of reference. Practice in the use of generic and specific indices and bibliographies, and in the preparation of the latter; methods of preparing technical papers for publication; zoological nomenclature. This course, of a technical nature, is intended to aid students specializing in zoology or entomology in their contact with literature.

131. **The Phylogeny and Classification of Insects.** First term. Credit four hours. Prerequisites, Entomology 30 and must be preceded or accompanied by Entomology 15 and 122. Professor BRADLEY and Mr. PATE. Lectures, W F 10. Laboratory, T Th 1:40–4. Comstock 300. Laboratory fee, $3.

Lectures on the evolution and classification of the orders and families of insects, living and extinct, and on their comparative morphology and bionomics; a laboratory study of the taxonomic literature on insects (exclusive of the larger orders of Holometabola) and of the classification and characters of representative genera and species. For continuation see courses 133 and 134.

[133. **Taxonomy of the Holometabola: Coleoptera and Diptera.** Second term. Credit three hours. Given in alternate years. Not given in 1942–43.]

134. **Taxonomy of the Holometabola: Lepidoptera and Hymenoptera.** Second term. Credit three hours. Prerequisites, Entomology 30 and 122; should be preceded by Entomology 15 and 131. Professor BRADLEY, Dr. FORBES, and Mr. PATE. Lecture, W 10. Laboratory, T Th 1:40–4, Comstock 300. Laboratory fee, $3. Given in alternate years.

Lectures on the classification, comparative morphology, and the bionomics of the Lepidoptera and Hymenoptera; a laboratory study of the taxonomic literature and of the classification and characters of representative genera and species of these orders. This course, together with course 133, is a continuation of course 131.

185. **Insect Physiology.** First term. Credit four hours. Prerequisites, Chemistry 102 or 104, Physics 3 and 4, Insect Morphology 122. Dr. PATTON and Mr. METCALF. Lectures, M W 9. Comstock 145. Laboratory, T Th 1:40–4. Comstock 265. Fee, $2.50.

An introductory course for upperclassmen and graduate students. The physiology of insect systems is discussed and demonstrated by a series of laboratory exercises.

RESEARCH

300. **Research.** Throughout the year. Prerequisite, permission to register from the professor under whom the work is to be taken. Comstock Hall.

300a. **Insect Ecology.** Professor PALM.

300b. **Insect Morphology, Histology, and Embryology.** Dr. BUTT.

300c. **Taxonomy.** Professors BRADLEY (all orders), MATHESON (Diptera), HOOD (Thysanoptera), and Dr. FORBES (Lepidoptera).

300d. **Economic Entomology.** Professors MATHESON, READIO, and PALM; Assistant Professors LEIBY, COLLINS, SCHWARDT, HANSBERRY, and RAWLINS; Doctor WATKINS; at Geneva, Professors PARROTT, GLASGOW, CHAPMAN, and HARTZELL.

300e. **Medical Entomology and Parasitology.** Professor MATHESON.

300f. **Apiculture.** Professor PHILLIPS.

300g. **Limnology and Fisheries.** Associate Professor MOTTLEY.

300h. **Insect Physiology.** Dr. PATTON.

300i. **Insect Toxicology.** Assistant Professors HANSBERRY and NORTON.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

In addition to the foregoing, graduate research in certain fields of Applied Entomology is also available at Geneva, New York. For further information see page 197.

SEMINARIES

Jugatae. Throughout the year. M 4:15–5:15. Comstock 145.
The work of an entomological seminar is conducted by the Jugatae, an entomological club that meets for a discussion of the results of investigations by its members.

Seminar in Economic Entomology. First and second terms. Required of graduate students in economic entomology. Professor READIO and Doctor WATKINS. W 4:15. Comstock 145.

Seminar in Insect Toxicology. Second term. Open to qualified graduate students. Assistant Professors HANSBERRY and NORTON. Th 4:15. Comstock 145.

Seminar in Insect Behavior. First term. Professor PHILLIPS. T F 4. Comstock 17. A discussion period for advanced students only.

FISH CULTURE

Comstock Hall; *Associate Professor* MOTTLEY.

Fish Culture 1, 2, 3, 4 (See under LIMNOLOGY AND FISHERIES, p. 86)

GENERAL BIOLOGY

Roberts Hall; *Acting Assistant Professor* HOOD.

Approved Major and Minor Subjects (key to symbols on p. 41)

General Biology 4.

1. *General Biology.* Throughout the year. Credit three hours a term.

5. **Laboratory Methods in Biology.** Second term. Credit two or three hours. Prerequisite, Biology 1 or Zoology 1 and permission to register. Doctor NEVIN. Lecture and laboratory, T or F 10–12:30, and one or more periods by appointment. Roberts 302.
For students who intend to teach or to follow some phase of biology as a profession. This course includes such subjects as: laboratory equipment; collection, preservation, and storage of materials; sectional and non-sectional preparations of animal tissues for histological study; injection of blood vessels and embalming; preparation of bird and mammal skins for study; chart making; introduction to photography including the preparation of lantern slides; use of micro-projector; theory and use of 16-millimeter sound and silent projection apparatus. Laboratory fee, $5 or $7.50.

7. **General Biology.** Throughout the year. Prerequisite, at least twelve hours in animal or plant sciences. Acting Assistant Professor HOOD. One conference period a week and a minimum of twelve hours in animal or plant sciences to be arranged.

For graduate students whose major field is outside of animal or plant sciences and who wish to obtain a more general knowledge of biological science than that offered in the various restricted fields. The conferences will deal with the unification of biological knowledge, discussion of theories and recent advances. Students who expect to teach in other fields may find the course useful in rounding out a cultural background.

GENETICS

(See under ANIMAL SCIENCES, p. 78, and under PLANT SCIENCES, p. 99)

LIMNOLOGY AND FISHERIES

Comstock Hall; *Associate Professor* MOTTLEY.

Approved Major and Minor Subjects (key to symbols on p. 41)

Fisheries 1, 2, 4
Limnology 1, 2, 4

The courses offered in this field require a certain background in other subjects. A student preparing to major in fresh-water biology or fisheries after graduation will find the following sequence of courses helpful: First year, Zoology 1; second year, Botany 1, Zoology 8 and 16, and Entomology 12; third year, Entomology 32, 171, 173 and 174; fourth year, Entomology 172, Botany 115. Students are urged to obtain a grounding in Statistics; and Zoology 22 is recommended before graduation.

171. *Limnology.* Second term. Credit three hours.

173. *Fishery Biology.* First term. Credit three or four hours.

[174. *Fish Culture.* Second term. Credit three hours. Not given in 1942–43.]

Descriptions of the courses mentioned above will be found in the *Announcement of the College of Agriculture.*

[172. **Advanced Limnology.** First term. Credit three hours. Prerequisite, permission to register. Associate Professor MOTTLEY. Lecture, Th 11. Comstock 145. Laboratory, F 1:40–4, S one period by appointment. Comstock 110. Laboratory fee, $7.50. Not given in 1942–43.]

A qualitative and quantitative treatment of the problem of the productivity of inland waters.

300g. **Research in Limnology and Fisheries.** First and second terms. Should be preceded or accompanied by courses 173, 174, and 171. Associate Professor MOTTLEY. Hours, credit, and laboratory fees to be arranged.

Facilities are provided for laboratory and field work and conferences in problems related to fresh-water biology and fisheries.

Seminar in Fisheries. First and second terms. Associate Professor MOTTLEY Time and place to be arranged.

For the discussion by qualified students of the principles of fishery management.

NATURE STUDY

Fernow Hall; *Professor* E. L. PALMER.
Nature Study 1, 2, 3, 4 (See under SCHOOL OF EDUCATION, p. 145)

PALEONTOLOGY

McGraw Hall; *Professor* C. W. MERRIAM.
Paleontology 1, 2, 3, 4 (See under GEOLOGY, p. 113)

PARASITOLOGY

Comstock Hall; *Professor* ROBERT MATHESON.
Parasitology 1, 2, 3 (See under ENTOMOLOGY, p. 83)

James Law Hall; *Professor* D. W. BAKER.
Veterinary Parasitology 1, 2, 3, 4 (See under VETERINARY MEDICINE, p. 190)

PATHOLOGY

Moore Laboratory; *Professors* PETER OLAFSON and C. W. BARBER.
Animal Pathology 1, 2, 3, 4 (See under VETERINARY MEDICINE, p. 191)

PHYSIOLOGY

James Law Hall; *Professors* H. H. DUKES, C. E. HAYDEN, and J. A. DYE.
Physiology 1, 2, 3, 4 (See under VETERINARY MEDICINE, p. 190)

POULTRY HUSBANDRY

Rice Hall; *Professors* F. B. HUTT, G. F. HEUSER, G. O. HALL, L. C. NORRIS, A. L. ROMANOFF, J. H. BRUCKNER, W. F. LAMOREUX, and R. K. COLE.
Poultry Husbandry 2, 4 (See under AGRICULTURE, p. 136)

PSYCHOLOGY

Morrill Hall; *Professors* H. P. WELD, K. M. DALLENBACH, H. S. LIDDELL, R. M. OGDEN, A. L. WINSOR, F. S. FREEMAN, G. L. KREEZER, O. D. ANDERSON, T. A. RYAN, and R. K. WHITE.

Approved Major and Minor Subjects (key to symbols on p. 41)

Applied Psychology 1, 2, 3, 4
Experimental Psychology 1, 2, 3, 4
History of Psychology 3
Physiological Psychology 1, 2, 3, 4
Psychobiology 1, 2, 3, 4
Psychology 1, 2, 3, 4
Social Psychology 1, 2, 3, 4
Systematic Psychology 3

The research department possesses a laboratory in Morrill Hall with rooms for general and individual research, for small animal research, for apparatus, for the library of periodical literature, and for meetings of the seminaries. This laboratory also includes a workshop for the construction and assemblage of apparatus, and it contains the editorial offices of *The American Journal of Psychology*.

At the Cornell Behavior Farm, a farm of 100 acres near Ithaca, laboratories are equipped for investigations in neuro-endocrinology, the conditioned reflex, and the experimental neurosis.

1. *Elementary Psychology*. Either term. Three hours a week.
2. *The Special Psychologies*. Second term. Three hours a week.
3. *Introductory Laboratory*. Either term, or both terms. Six hours a week.

[4. **Intermediate Course in Psychology.** First term. Credit three hours. Prerequisites, Psychology 1 and consent of the instructor. Professor WELD. M W F 9. Morrill 306. Not given in 1942–43.]

Intended for students who wish to continue the study of psychology at a more advanced level of presentation. Lectures, textbook assignments, and demonstrations.

5. **Perception.** First term. Credit three hours. Prerequisites, Psychology 1 and consent of the instructor. Professor WELD. M W F 9. Morrill 306.

The place of perception in psychology and its relation to every-day living. A review of the important experiments with special emphasis upon recent developments and upon modern theories of perception.

6. **Memory and Thinking.** Second term. Credit three hours. Prerequisites, Psychology 1 or consent of the instructor. Assistant Professor WHITE. M W F 9. Morrill 306.

Rote and logical memory, factors influencing memory; relationships between language and thought; repression, wishful thinking, autistic thinking, group thinking, creative thinking, and critical scientific thinking.

7. **Animal Psychology.** First term. Credit three hours. Prerequisite, Psychology 1. Assistant Professor KREEZER. M W 10, and a laboratory period to be arranged. Morrill 340.

A study of the behavior and the psychological capacities of animal forms. Emphasis will be placed on the relation of research in this field to problems of human psychology: motivation, sensory and perceptual discrimination, learning, problem-solving, adjustment to frustration, and development of behavior. The laboratory period is designed to give the student a direct acquaintance with representative methods of investigating these phenomena.

8a. **Aesthetics: Psychology of Art.** First term. Credit three hours. Professor OGDEN. M W F 11. Goldwin Smith, Museum of Casts.

A study of the aesthetic experience as criterion of art and skill. Special consideration will be given to the underlying principles of music, poetry, and the visual arts. Designed for students interested in the fine arts as well as for those interested in the philosophical theory of values.

For a companion course, see Philosophy 8b, Aesthetics: Philosophy of Art.

Social Psychology. Throughout the year. Credit three hours a term. Prerequisite, permission of the instructors. Professor COTTRELL (Sociology) and Assistant Professor WHITE (Psychology). T Th S 10. McGraw 201. Fee for materials, $2.

An interdepartmental course. Given in place of courses formerly listed as: Psychology 9 and 10 and Sociology and Anthropology 30. Terms may be elected separately.

11. **Physiological Psychology of the Senses.** First term. Prerequisite, consent of the instructor. Professor DALLENBACH. M W F 11. Morrill 306.

A systematic review and criticism of the experimental literature of sense psychology. Lectures, discussions, and demonstrations.

12. **Legal Psychology.** Second term. Professor WELD. M W F 11. Morrill 340.

Psychological aspects of the origin and growth of the law, and of legal theory; psychological problems of evidence and responsibility.

[13. **History of Experimental Psychology.** First term. Credit three hours. Prerequisite, consent of the instructor. Professor WELD. T Th S 11. Morrill 306. Not given in 1942–43.]

14. **Contemporary Psychology.** First term. Professor WELD. T Th S 11. Seminary Room, Morrill.

A comparative study of current psychological schools and points of view.

15. **Psychology of the Abnormal.** Second term. Prerequisites, Psychology 1 and consent of the instructor. Assistant Professor KREEZER. M W F 10. Morrill 340.

A survey of the psychological disorders and deficiencies: maladjustments of normal children and adults; mental deficiency; hysteria, neurasthenia, and psychasthenia; schizophrenia, manic-depressive psychosis, and organic psychoses. A consideration of psychological, physiological, and genetic factors.

19. **Minor Research Problems.** Either term or throughout the year. Credit three hours a term. Prerequisite, courses 1, 3, and the consent of the instructor. Professors WELD and DALLENBACH, Assistant Professors KREEZER, RYAN and WHITE. Hours to be arranged. Morrill, Psychological Laboratory.

Experimental research or informal study in general, abnormal, animal, applied, physiological, and social psychology. The course is designed for students majoring in psychology who are prepared to undertake original investigation.

[20. **The Correlational and Psychophysical Methods.** Second term. Credit three hours. Professor DALLENBACH. M W F 2–4. Morrill, Psychological Laboratory. Not given in 1942–43.]

[22. **Genetic Psychology.** Second term. Credit three hours. Prerequisites, Psychology 1 and consent of the instructor. Assistant Professor KREEZER. M W F 10. Morrill 306. Not given in 1942–43.]

A study of the individual life-career and the development of the psychological functions. Lectures and textbook assignments.

[116. **Reading of German Psychology.** Second term. Credit three hours. Prerequisite, consent of the instructor. Assistant Professor KREEZER. Hours to be arranged. Morrill, Psychological Laboratory. Not given in 1942–43.]

The accurate reading and translation of psychological texts and articles. The course presupposes a knowledge of grammar.

121. **Technique of Experimentation.** Second term. Credit three hours. Professor DALLENBACH. T Th 2. Morrill, Psychological Laboratory.

A study of the principles and processes of psychological research.

129. **Seminary in Psychology.** Second term. Professors WELD and DALLENBACH. Hours to be arranged. Morrill, Seminary Room.

PSYCHOBIOLOGY

In the courses listed below students are given the opportunity to observe and to participate in the psychosomatic investigations in progress at the Cornell Behavior Farm.

30. **Experimental Psychophysiology.** First term. Repeated in the second term. Credit three hours. Prerequisite, Psychology 1. Assistant Professor ANDERSON. Laboratory, T Th 1:40–4. Lecture hour to be arranged. Morrill 301. Fee, $5.

Laboratory observations and lectures upon the principal physiological mechanisms of behavior in man and in lower animals. The interrelationship between physiological and mental processes is emphasized. The effects of the emotions upon the nerve-muscle, cardiovascular, respiratory and digestive systems and the influence of the vitamins, metabolism, and the endocrine glands upon personality and behavior are studied in detail.

Of special value to premedical students and those preparing to become nurses, technicians, or clinical psychologists.

30a. **Psychosomatic Problems and Theory.** First term. Credit three hours. Prerequisite, Psychology 1. Professor LIDDELL. W 2–4, one hour to be arranged. Morrill, Seminary Room.

Recent advances in the investigation of the interrelationship of mind and body. Discussions and occasional demonstrations at the Cornell Behavior Farm. This course is intended to supplement 30, although students who have completed Psychology 1 may elect it with consent of the instructor.

31. **Endocrinology and Behavior.** First term. Credit three hours. Prerequisite, Psychology 1. Assistant Professor ANDERSON. M W F 9. Morrill 303.

The endocrine glands and involuntary nervous system in relation to behavior. The influence of the internal secretions upon the personality and behavior of the individual. Informal discussion, selected readings, and demonstrations.

132. **Animal Behavior in Experimental Medicine.** Second term. Credit three hours. Professor LIDDELL. W 2–4, one hour to be arranged. Morrill, Seminary Room.

A review of recent experimental studies of the adjustment of the animal to its environment with particular reference to the conditioning of the various physiological functions. Consideration will be given to the limits of psychobiological adjustment in animals and man. The bearing of animal conditioning on the problem of war neuroses will be stressed. The class will participate in conditioned reflex experiments at the Cornell Behavior Farm.

133. **Informal Study and Research in Psychobiology.** Throughout the year. Hours to be arranged. Professor LIDDELL and Assistant Professor ANDERSON. Cornell Behavior Farm.

Students may participate in the investigations in progress at the Cornell Behavior Farm.

EDUCATIONAL PSYCHOLOGY

Mental Measurements. (Education 7) First term. Credit three hours. Prerequisite, a course in general or educational psychology, or human growth and development. Professor FREEMAN. T Th S 9. Goldwin Smith 234.

Development of individual and group tests of intelligence and personality; principles underlying their construction and use; their use in schools, psychological clinics, and in other fields. The nature of mental abilities. The use of educational tests. Demonstrations in administering and interpreting tests.

Experimental Educational Psychology. (Education 8) Either term. Credit and hours to be arranged. Consent of the instructor is required. Education 7 or its equivalent should normally precede this course. Professor FREEMAN.

The application of psychological and statistical methods to problems in education.

Individual Differences. (Education 18) Second term. Credit three hours. Prerequisite, a course in general or educational psychology, or human growth and development. Professor FREEMAN. M 2–4 and a third hour to be arranged. Goldwin Smith 236.

The nature, causes, and implications of individual differences in abilities and behavior. Study and observations of atypical groups.

APPLIED PSYCHOLOGY

50. **Psychology of Inefficiency.** First term. Credit three hours. Prerequisite, Psychology 1. Assistant Professor RYAN. T Th S 10. Goldwin Smith C.

A survey of the external and internal factors which affect the efficiency, speed, and accuracy of human work. Consideration will be given to sedentary or "mental" work as well as to physical work, in relation to fatigue, monotony, rest, sleep, and the effects of noise, light, temperature, narcotics, incentives, and social factors.

51. **Psychotechnology in Business and Industry.** Second term. Credit three hours. Prerequisite, Psychology 1. Assistant Professor RYAN. T Th S 10. Goldwin Smith C.

A study of experimental and statistical analyses of psychological problems in vocational selection, industrial production, personnel, advertising, selling, and market research.

Military Personnel Administration. (Hotel Administration 115) First term. Credit 2 hours. Juniors and seniors preparing for service, as officers in the Armed forces. Professor WINSOR. T Th 10. Warren 125.

Personnel Administration. (Hotel Administration 119) Second term. Credit three hours. Prerequisite, Psychology 1. Professor WINSOR. M W F 8. Plant Science 233.

Seminar in Personnel Administration. (Hotel Administration 219) Second term. Credit two hours. Prerequisite, course 18. Open to qualified seniors and graduate students. Professor WINSOR. Th 4:15–6. Warren 340.

TAXONOMY OF INSECTS

Comstock Hall; *Professor* J. C. BRADLEY.

Insect Taxonomy 1, 2, 3 (See under ENTOMOLOGY, p. 84)

ZOOLOGY

Professors H. B. ADELMANN, A. A. ALLEN, W. J. HAMILTON, JR., F. B. HUTT, PAUL KELLOGG, S. L. LEONARD, ROBERT MATHESON, J. W. PAPEZ, G. M. SUTTON, A. H. WRIGHT, and B. P. YOUNG; and *Doctors* R. B. BARDEN, P. W. GILBERT, AMY G. MEKEEL, and E. C. RANEY.

Approved Major and Minor Subjects (key to symbols on p. 41)

Zoology 1, 2, 4
Invertebrate Zoology 1, 2, 3, 4
Vertebrate Zoology 1, 2, 3, 4
Neurology 1, 2, 3, 4
Ecology 1, 2, 3, 4
Histology and Embryology 1, 2, 3, 4
Ornithology 1, 2, 3, 4

In order to undertake graduate study the student not only should be prepared in the fundamentals of Zoology but also should have or acquire a foundation in the particular phase of this subject which he intends to pursue. The members of

the staff are prepared to direct the research work of graduate students in connection with the Summer Session of Cornell University.

Attention is also directed to the fields of study and courses offered in the Department of Entomology (pp. 82 to 85.)

1. *Introductory Zoology.* Throughout the year. Three hours a week.

11. *Comparative Anatomy.* Through the year. Three hours a week.

3. *The Conservation of Wild Life.* First term. Credit two hours.

8. *Elementary Taxonomy and Natural History of Vertebrates.* Credit three hours each term.

110. *Economic Zoology.* First term. Credit one hour.

2. *Game Management.* First term. Credit three hours.

9. *General Ornithology.* Second term. Credit three hours. One lecture and two laboratory periods a week.

131. *Techniques in Ornithology.* First term. Credit three hours.

106. *Histology (Veterinary).* Throughout the year. Four hours a week.

109. *Embryology (Veterinary).* Second term. Two hours a week.

101. *The Tissues: Histology and Histogenesis.* First term. Four hours a week.

221. *Structure of the Human Body.* First term. Credit three hours.

223. *Physical Anthropology and Human Evolution.* Second term. Credit three hours.

224. *Artistic Anatomy.* Throughout the year. One lecture and six hours of laboratory a week. Given in alternate years.

Histology and Embryology

Stimson Hall; *Professor* H. B. Adelmann and *Doctor* R. B. Barden.

Advanced work in histology and embryology is of necessity individual. Advanced students are sometimes recommended to take some one or more of the general courses in the subject. As preliminary to graduate work, students are expected to have had the courses in the tissues and one of the following: the organs, special histology, embryology. A year's work in zoology, biology, anatomy, or physiology may with advantage precede advanced work in this subject.

102. **The Organs: Histology and Development.** Second term. Credit four hours. Prerequisite, course 101 or its equivalent. Professor Adelmann and assistants. Lectures, W F 10. Stimson G-1. Laboratory, W F 1:40–4. Stimson 206. Laboratory fee, $6.

A continuation of course 101. Courses 101 and 102 together give the fundamental facts of the microscopic structure and development of the body. There is also offered opportunity to gain knowledge of technique in the fixing, embedding, and sectioning of selected organs.

104. **Vertebrate Embryology.** Second term. Credit five hours. Prerequisite, Biology 1 or Zoology 1. Professor Adelmann, Dr. Barden, and assistants. Lectures, T Th 11 and lecture or conference, S 11. Stimson G-1. Laboratory, Section I, T Th 8–11; Section II, T Th 1:40–4. Stimson 206. Laboratory fee, $6.50.

An introduction to general vertebrate embryology designed to provide a basis for the appreciation of biological problems. The material is treated comparatively with particular emphasis on the development of the amphibian, the bird, and the mammal. A few invertebrate forms are used where desirable for illustration.

107. **Advanced Histology and Embryology.** Throughout the year. Credit three hours or more a term. Prerequisite, courses 101 and 102 or 104, or equivalent courses. Professor Adelmann and instructor. Day and hours to be arranged. Stimson 206.

[115. **Experimental Embryology.** First term. Credit two hours. Professor Adelmann. The course will be conducted as a seminar. Lectures with reports by students dealing with the experimental analysis of developmental processes. Hours to be arranged. Stimson. Not given in 1942–43.]

108. **Seminar.** First and second terms. One hour each week. Time to be arranged.

For the discussion of problems in the field of histology, or embryology; for the review of current literature; for the presentation of original work by the members of the staff and those doing advanced work in the department.

Undergraduate course 101 may often be attended with advantage by graduate students. Satisfactory work in this and in 102 and 104 obviates the requirement of the Qualifying Examination.

Endocrinology

Stimson Hall; *Professor* S. L. Leonard.

140. **Experimental Endocrinology.** Second term. Credit two or three hours. Prerequisite, Zoology 1 or General Biology and Chemistry. Associate Professor Leonard. Open to graduate students only. Lectures 2 hours. Stimson G-25. Laboratory 1 hour for a limited number of students. Hours to be arranged. Laboratory fee, $4.50.

Lectures on comparative gross and microscopic anatomy of endocrine glands, and their physiology in the light of recent researches. The lectures in this course will cover the comparative anatomy (both gross and microscopic) of the vertebrate endocrine glands from the evolutionary and experimental view point. There will also be included the morphological and biochemical effects of the hormones, particularly the interglandular relationships centered around the pituitary gland. The bio-assay method of hormones will be given. The course will serve to prepare a student for research in this field or related fields, and to introduce him to the terminology and literature of the subject.

Vertebrate Taxonomy and Ecology

Stimson Hall; *Professors* A. H. Wright and W. J. Hamilton, jr., and *Doctor* E. C. Raney.

22. **Ichthyology.** First term. Credit three hours. Professor Wright and Dr. Raney. Lectures, T Th 8. Stimson G-25. Laboratory, F 1:40–4 or S 8–10:30. Stimson 225. Laboratory fee, $5.

In the lectures, special emphasis is laid on the principal phases of fish life; the taxonomy, origin, and evolution of fossil and living groups; geographical distribution; and the literature and institutions of zoology. Laboratory periods are devoted to identification and field trips.

23. **Herpetology.** Second term. Credit three hours. Professor Wright, Associate Professor Hamilton, and Doctor Raney. Lectures, T Th 8. Stimson G-25 or S 8–10:30. Stimson 225. Laboratory fee, $5.

Lectures on amphibians and reptiles, their life histories, distribution, and taxonomy. Laboratory periods deal with identification and field trips.

[25. **Mammalogy.** Second term. Credit three hours. Associate Professor Hamilton. Lectures, T Th 8. Stimson G-25. Laboratory, F 1:40–4 or S 8–10:30. Stimson 225. Laboratory fee, $5. Not given in 1942–43.]

Discussion of principal phases of mammalian life: origin, distribution, habits, and literature. Laboratory periods are devoted to methods of field collecting, census taking, life history studies, preparation of skins and skeletons, and identification of North American species.

112. **Literature of Economic Zoology, Conservation, and Ecology.** Second term. Credit one hour. Professor Wright, Associate Professor Hamilton, and Dr. Raney. Th 4:30 p.m. Stimson 225. Limited to upperclass students and graduates.

The literature of economic zoology, ecology, limnology, oceanography, and kindred fields; fish and fisheries (for profit and pleasure); amphibians and reptiles, their uses; small and big game (commercial and sport); aquaria; zoological gardens; preserves; game farms; animals in relation to recreation, settlement, forestry, agriculture, and other industries; biologic resources, their exploration, conservation, utilization, and management.

67. **Seminar in Systematic Vertebrate Zoology.** First and second terms. Professor Wright. T 7:30 p.m. Stimson 225.

Life-zone plans of North America, 1917–1936. Distribution and origin of life in North America. Zoogeography of the Old World. Animal coloration. Other topics, to be announced.

Invertebrate Zoology

Stimson Hall; *Associate Professor* B. P. Young.

16. **Invertebrate Zoology.** Throughout the year. Credit three hours a term. Prerequisite, course 1 or equivalent. Associate Professor Young. Lecture, W 8, Stimson G-1. Laboratory, T Th 1:40–4. Stimson 116.

Consideration is given to the bionomics, morphology, development, and phylogeny of the invertebrates, and to certain taxonomical and physiological aspects of the major groups.

Neurology

Stimson Hall; *Professor* J. W. Papez.

225. **Comparative Neurology.** Second term. Credit three hours. Prerequisite, nine hours of Animal Biology. Professor Papez. T Th 8–11. Stimson 316.

A comparative study of the vertebrate nervous system based on dissections of brains of shark and dog, and sections of cat brain stem; of the chief nerve mechanisms that determine the form and structure of the nervous systems, their evolutionary and functional significance. One lecture and two laboratory periods. Laboratory fee, $6.

226. **Cerebral Mechanisms.** Second term. Credit three hours. Prerequisite, course 225. Professor Papez. Given if desired by a sufficient number of students. Hours to be arranged. Stimson Hall 316.

A course of study of the cerebrum of lower mammals and the primates with special reference to the subcortical connections and levels, and functional significance of the various levels and cortical regions of the human brain. Laboratory fee, $3.

Ornithology

Fernow Hall; *Professors* A. A. Allen, G. M. Sutton, and P. P. Kellogg.

Before registering for a major in Ornithology a student must have thorough training in biology, and in the majority of cases must expect to do summer work on his problem.

126. **Advanced Ornithology.** First term. Credit three hours. Prerequisite, course 9 or Vertebrate Taxonomy 8. Professor Allen. Lecture, W 11. Fernow 122. Laboratory and field work, T Th 1:40–4. Fernow 210. Laboratory fee, $3.

The structure and classification of birds; geographical distribution; the literature and institutions of ornithology; identification of representative birds of the world. The first part of the term is devoted to field work on the fall migration and the identification of birds in winter plumage. Designed primarily for students specializing in ornithology or animal biology.

133. **Bird Speciation and Museum Methods in Ornithology.** First term. Credit three hours. Prerequisites, Ornithology 9, 126, and 131, and permission to register. Assistant Professor Sutton. S 8–1, with lecture during laboratory and several all-day field trips. Fernow 308. Laboratory fee, $3.

For students planning to participate in scientific expeditions and to carry on taxonomic work in Ornithology. This course includes such subjects as: field and museum equipment; collecting and preparing bird skins; and the preparation of taxonomic papers and avifaunal lists; drawings in line, half-tone, or full color, and other illustrative material.

136. **Ornithology Seminar.** Throughout the year. M 7:30–9 p.m. Fernow Seminar Room. Required of all graduate students in Ornithology.

Zoology, all Branches

400. **Research Problems.** Credit and hours to be arranged. Problems may be undertaken in any phase of zoology but the consent of the instructor concerned is a prerequisite.

PLANT SCIENCES

NOTE—*Laboratory space is limited and is often overtaxed, especially in courses which admit both graduate students and undergraduates. Graduate students who desire to enroll in such courses are warned to make application for space well in advance of the beginning of instruction. This holds particularly of the second term, since the College of Agriculture holds its preregistration for undergraduates in January. Failure to arrange for laboratory space in advance will probably result in exclusion from courses.*

BACTERIOLOGY

Dairy Building; *Professors* J. M. SHERMAN, OTTO RAHN, C. N. STARK, GEORGES KNAYSI, and I. C. GUNSALUS; at Geneva, *Professors* R. S. BREED, H. J. CONN, G. J. HUCKER, C. S. PEDERSON, M. W. YALE, and A. W. HOFER.

Approved Major and Minor Subjects (key to symbols on p. 41)

Bacteriology 1, 2, 3, 4

(See also Pathogenic Bacteriology 1, 2, 3, 4, Moore Laboratory, *Professors* W. A. HAGAN, PETER OLAFSON, E. L. BRUNETT, and A. ZEISSIG, under VETERINARY MEDICINE, p. 190)

Before taking up graduate work in bacteriology, it is desirable that the student have general chemistry, qualitative and quantitative analysis, organic chemistry, and introductory courses in the biological sciences.

Formal courses open to undergraduate and graduate students are given in the following subjects:

1. **General Bacteriology.** First term. Credit six hours. Prerequisite, Chemistry 101. Professor SHERMAN, Assistant Professor GUNSALUS, Dr. NIVEN, and assistants. Lectures, M W F 11. Laboratory practice, M W F 1:40–4. Dairy Industry Building 218 and 301. Laboratory fee, $15.

An introductory course; a general survey of the field of bacteriology, with the fundamentals essential to further work in the subject.

103. **Applied Bacteriology.** Second term. Credit six hours. Prerequisites, course 1, quantitative analysis, and organic chemistry. Professor SHERMAN, Assistant Professor GUNSALUS, and Dr. NIVEN. Lectures, recitations, and laboratory practice, M W F 1:40–5. Dairy Industry Building 119 and 301. Laboratory fee, $15.

An advanced course dealing with the important groups of bacteria which are of significance in water, milk, and foods, together with the methods used in the bacteriological analysis and control of these products.

105. **Higher Bacteria and Related Microorganisms.** First term. Credit four hours. Prerequisite, course 1. Associate Professor KNAYSI and Mr. SMILEY. Lectures, recitations, and laboratory practice, T Th 1:40–5. Dairy Industry Building 119 and 323. Laboratory fee, $15.

A study of the higher bacteria, together with the yeasts and molds that are of especial importance to the bacteriologists.

106. **Soil Microbiology.** (Same as Agronomy 106.) Second term. Credit three hours. Prerequisite, course 1, Agronomy 1, and Chemistry 201 or its equivalent. Lectures, M W 8. Caldwell 143. Laboratory, W or F 1:40–4. Caldwell 201. Professor J. K. WILSON.

A course in biological soil processes designed primarily for students specializing in soil technology or bacteriology. The laboratory work is supplemented by reports and by abstracts of important papers on the subject. Laboratory fee, $5.

210. **Physiology of Bacteria.** First term. Credit two hours. Prerequisites, course 1 and at least one additional course in bacteriology. Professor RAHN. Lectures, T Th 8. Dairy Building 120.

An advanced course in the physiology of bacteria and the biochemistry of microbic processes.

210a. **Physiology of Bacteria, Laboratory.** Second term. Credit three hours. Must be preceded or accompanied by course 210. Professor RAHN and Mr. TANNER. M 11 and M W 1:40–5. Dairy Building. Laboratory fee, $15.

An advanced laboratory course dealing with the biological principles of growth, fermentation, and death of bacteria.

211. **Taxonomy of Bacteria.** Second term. Credit two hours. Prerequisites, course 1 and at least one additional course in bacteriology. Professor RAHN. Lectures, W F 11. Dairy Building 120.

An advanced course, dealing with the natural groups and variability of bacteria, with a study of the systems of nomenclature and classification.

212. **Selected Topics in Bacteriology.** Throughout the year. Credit one hour a term. Professor RAHN. F 8. Dairy Industry Building 120.

213. **Morphology and Cytology of Bacteria.** First term. Credit two hours. Associate Professor KNAYSI. Lectures, T Th 9. Dairy Building 119.

The morphology, cytology, and microchemistry of microorganisms.

221. **Seminary.** Throughout the year. Without credit. Required of graduate students specializing in the department. Professor SHERMAN. Hours to be arranged. Dairy Building.

Research problems may be selected in various phases of pure and applied bacteriology; taxonomy; physiolgy; technique; dairy bacteriology; food bacteriology; water and sanitary bacteriology; industrial fermentations. (For pathogenic bacteriology, see Animal Pathology and Bacteriology; for soil bacteriology, see Agronomy.)

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

Work in Dairy, Soil, Fermentation, Food, and Systematic Bacteriology is also offered at Geneva. For further information see page 197.

BOTANY AND PLANT PHYSIOLOGY

Professors LEWIS KNUDSON, A. J. EAMES, L. W. SHARP, O. F. CURTIS, W. C. MUENSCHER, L. C. PETRY, L. F. RANDOLPH, D. G. CLARK, K. C. HAMNER, and R. T. CLAUSEN; at Geneva, *Professors* M. T. MUNN, B. R. NEBEL, and W. F. CROSIER.

Approved Major and Minor Subjects (key to symbols on p. 41)

Botany 2, 4
Cytology 1, 2, 3, 4
Economic Botany 1, 2, 3, 4
Plant Morphology (including Anatomy) 1, 2, 3, 4
Paleobotany 1, 2, 3, 4
Plant Physiology 1, 2, 3, 4
Plant Taxonomy 1, 2, 3, 4

The laboratories of the department are in the Plant Science Building, one of the buildings of the College of Agriculture, and are well equipped with the necessary apparatus and collections for research. The herbarium contains abundant local and foreign material for taxonomic study.

The very rich flora about Ithaca and its accessibility make the location especially advantageous for all phases of botany, as material may be easily obtained. Gardens and greenhouses are also available for the growing of experimental material.

The University Library and the library of the College of Agriculture are well equipped with special works and periodicals dealing with all phases of botanical science. Books in more constant use are available in connection with the laboratories.

Seminars are conducted in several of the fields listed above. The purpose of these various seminars is not only to keep abreast of the literature of the subject, but to furnish to the student an opportunity to gain experience in presenting the results of his own research or in critically evaluating the work of others. Graduate

students are expected to attend the seminars dealing with their special fields of work.

As a prerequisite for work in any phase of botany the student will be expected to have a knowledge of the fundamental features of botanical science. For work in paleobotany a knowledge of the fundamental features of both botany and geology is prerequisite.

A fundamental training in botany and chemistry is required of any student who expects to major in plant physiology. If it is not possible to obtain this training before entering upon graduate work at Cornell, then the student will be expected to broaden his knowledge in botany and chemistry after beginning graduate work.

The University conducts a Summer Session in which there is opportunity for graduate study and research in botany. A prospective student contemplating summer work in botany and plant physiology should correspond with the appropriate member of the staff before coming to Ithaca.

A fellowship carrying a stipend of $400 and a scholarship with a stipend of $200 are awarded in alternate years to graduate students in Botany. These awards carry exemption from the payment of tuition. In 1943–44 the scholarship will be awarded. One of the Henry Strong Denison Fellowships in Agriculture is awarded annually in the field of the plant sciences. This fellowship has a stipend of $1,000, but does not carry free tuition.

Plant Physiology

Professors Knudson and Curtis and *Assistant Professor* Clark.

31. *Introductory Plant Physiology.* First or second term. Credit four hours. Lectures, T Th 10. Plant Science 233. Laboratory, T Th or W F 1:40–4. Assignment to laboratory section must be made at the time of registration.

231. **Plant Physiology, Advanced Lecture Course.** Throughout the year. Credit three hours a term. Prerequisite, training in botany and chemistry, to be determined in each case by the department. Professors Knudson and Curtis. Lectures, M W F 10. Plant Science 143.

Lectures and discussions on physiological processes of plants and the factors influencing them and the relations of these processes to plant behavior.

232. **Plant Physiology, Advanced Laboratory Course.** Throughout the year. Credit three hours a term. Prerequisite or parallel, course 231. Professors Knudson and Curtis and Assistant Professor Clark. Laboratory, M 1:40–4, S 8–12:30. Plant Science 241. Laboratory fee each term, $10; breakage deposit, $5.

Principally a quantitative study of various phases of plant physiology. The student will apply chemical, physical, and bacteriological methods in the study of plant physiological processes.

233. **Seminar in Plant Physiology.** Throughout the year. Required of graduate students in Plant Physiology. Professors Knudson and Curtis and Assistant Professor Clark. Conference, F 11. Plant Science.

The presentation and discussion of current contributions to plant physiology; reports on the research problems of graduate students and members of the staff.

Research in Plant Physiology. Professors Knudson and Curtis and Assistant Professors Clark and Hamner.

Plant Anatomy

Professors Eames and Petry.

123. **Plant Anatomy.** First term. Credit four hours. Prerequisite, course 1 or the equivalent. Dr. Blaser. T 9–12:30; Th S 9–11:30. Lecture to be arranged within these periods. Plant Science 228. Laboratory fee, $5.

A detailed study of the internal structure of vascular plants with emphasis on determination and interpretation.

Research in Anatomy. Professor Eames.

Cytology

Professors Sharp and Randolph.

124. **General Cytology.** First term. Credit four hours. Prerequisites, Botany 1

or Zoology 1 or equivalent. Professor L. W. SHARP. Lectures, M W 9. Plant Science 143. Laboratory, M W or T Th 10–12:30. Plant Science 219. Assignment to laboratory section must be made at the time of registration. Laboratory fee, $5.

The principal topics considered are cells and their components, nuclear and cell division, meiosis and fertilization, and the relation of these to problems of development, reproduction, and heredity. Both plant and animal materials are used. Microtechnic is not included.

224. **Advanced Cytology.** Second term. Credit two hours. Prerequisites, Botany 124, Plant Breeding 101, and permission to register. Professor L. W. SHARP. Lecture, W 9. Plant Science 143. Laboratory and seminar, to be arranged.

An advanced course dealing mainly with recent researches in cytogenetics.

Research in Cytology. Professors SHARP and RANDOLPH.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

Cytological research in relation to cultivated plants is also available at Geneva. For further information see page 199.

MORPHOLOGY

Professors EAMES and PETRY.

(**Comparative Morphology of Fungi.** Given in the Department of Plant Pathology.)

126. **Morphology of Vascular Plants.** First and second terms. Credit three hours a term. Prerequisites, course 1 or its equivalent, and permission to register; first term prerequisite to second. Professor EAMES. Lecture, F 9. Plant Science 143. Laboratory, W 9–12:30; F 10–12:30. Plant Science 228. Laboratory fee, $5.

An advanced course in the comparative morphology, life histories, and phylogeny of vascular plants.

Research in Morphology. Professors EAMES and PETRY.

TAXONOMY

Professors MUENSCHER, EAMES, and Assistant Professor CLAUSEN.

13. **Trees and Shrubs.** First term. Credit four hours. Prerequisite, course 1 or its equivalent. Assistant Professor CLAUSEN. Lectures, T Th 9. Plant Science 143. Laboratory or field work, M W or T Th 1:40–4. Plant Science 211. Laboratory fee, $4.

The identification of trees and shrubs in summer and in winter conditions. During the first part of the term the work on identification is done largely in the field. The work of the latter part of the term is a study of the classification of woody plants.

117. **Taxonomy of Vascular Plants.** Second term. Credit four hours. Prerequisite, course 1 or its equivalent. Assistant Professor CLAUSEN. Lectures, T Th 9. Plant Science 143. Laboratory, T Th or W F 1:40–4. Plant Science 211. Laboratory fee, $4; deposit, $5.

A study of the kinds of seed plants and ferns, their classification into genera, families, and orders, and field work on the local flora. Emphasis is placed on wild plants, but the more commonly cultivated varieties receive some attention. Those desiring advanced work on special groups or problems may follow this with course 171.

219. **Advanced Taxonomy of Vascular Plants.** First term. Credit two hours. Prerequisite, course 117 or its equivalent and training in cytology and genetics. Assistant Professor CLAUSEN. Lecture, S 9. Laboratory, S 10–12:30. Plant Science 211.

A course designed particularly for students majoring in taxonomy. Emphasis is placed on the three phases of taxonomic study; floristics, experimental taxonomy, and monography. The work of the first part of the term will be done largely in the field and there will be at least two full week-end trips. In the latter part of the term, each student will do practical work on some group of plants.

Research in Taxonomy. Professors EAMES and MUENSCHER and Assistant Professor CLAUSEN.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

Research in taxonomy of fruits and vegetables is also available at Geneva. For further information see page 199.

PALEOBOTANY

Professors PETRY and EAMES.

Research in Paleobotany.

ECONOMIC BOTANY

Professor MUENSCHER.

53. **Poisonous Plants.** Second term. Credit one hour. Registration by permission. Professor MUENSCHER. Discussion and demonstrations, F 1:40–4. Plant Science 353. Laboratory fee, $1.

Special emphasis is placed on the identification, poisonous properties, and distribution of poisonous plants.

55. **Weed Identification and Control and Seed Analysis.** First term. Credit three hours. Prerequisite, course 1 or its equivalent. Professor MUENSCHER. Lecture, F 8. Plant Science 143. Laboratory, W F 1:40–4. Plant Science 353. Laboratory fee, $3.

Special emphasis is given to the habits, characteristics, and properties which make weeds harmful or undesirable, the losses and injury produced by them, and the method for their prevention, eradication, and control. Field and laboratory practice in the identification of weeds and seeds and practice in the recognition of seed impurities are provided. Students wishing to do additional or special work on seed analysis or testing may register in course 171.

115. **Aquatic Plants.** Second term. Credit three hours. Prerequisite, course 1 or its equivalent. Professor MUENSCHER. Lecture, W 9. Plant Science 353. Laboratory, M W 1:40–4. Plant Science 353. Laboratory fee, $4.

A study of the taxonomy and ecology of fresh water plants, beginning with the algae and concluding with the aquatic angiosperms.

Research in Economic Botany. Professor MUENSCHER.

GENERAL BOTANY

Professor PETRY and instructors.

1. *General Botany.* Throughout the year. Two lectures and one laboratory period a week.

OTHER COURSES

[161. **History of Botany.** Second term. No credit. Hours to be arranged. Plant Science 404. Not given in 1942–43.]

A course of lectures given by various members of the staff with the purpose of acquainting advanced students of botany with the historical development of their science.

171. **Special Problems in General Botany, Ecology, Economic Botany, Taxonomy, Morphology, Anatomy, Paleobotany, Cytology, and Physiology.** Throughout the year. Credit not less than two hours a term. Professors KNUDSON, EAMES, SHARP, CURTIS, PETRY, MUENSCHER, and RANDOLPH, Assistant Professors CLARK, HAMNER, and CLAUSEN. Hours by appointment.

Students engaged on special problems may register in this course. They must satisfy the instructor under whom the work is taken as to preparation for the problem chosen. The laboratory fee depends on the nature of the work and on the number of credit hours.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

In addition to the foregoing, graduate research in seed investigations is also available at Geneva. For further information see page 197.

GENERAL BIOLOGY

See under ANIMAL SCIENCES, p. 85.

PLANT BREEDING

Professors H. H. LOVE, C. H. MYERS, F. P. BUSSELL, R. G. WIGGANS, and J. R. LIVERMORE; *Doctors* ERNEST DORSEY and M. J. MURRAY; at Geneva, *Professor* R. WELLINGTON.

Approved Major and Minor Subjects (key to symbols on p. 41)

Genetics 1, 2, 4
Plant Breeding 1, 2, 4
Statistical Methods of Analysis 1, 2, 4

Students who are chiefly interested in the application of genetical principles to crop improvement will doubtless prefer to register in *plant breeding*. Problems for research will involve studies of such characters as yield, quality, disease, and insect resistance, and the like. Those students for whom the theoretical aspects of genetics hold the greater appeal will register in *genetics*. Their research problems will usually stress gene analyses and chromosomal relationships. Statistical methods include the analysis of data from any field of research, and a study of experimental methods and field plot technique.

The laboratories of this department are supplied with calculating machines necessary for statistical investigations, and are equipped with cameras and accessories for photographic work. The departmental library contains the principal books and periodicals dealing with plant breeding, evolution, and genetics. The department has greenhouse room for the use of graduate students. A garden near the laboratories affords the necessary room for most of the plant material used by graduate students. For more extensive plantings, room is provided on the University farms.

It is advisable that the student, before entering upon graduate work, should have had the following courses or their equivalent: genetics, plant breeding, general botany or elementary zoology or biology, elementary plant, animal, or human physiology, introductory inorganic chemistry, and elementary organic chemistry. A student who has not had most of these subjects will ordinarily find it impossible to complete his graduate work in the minimum time.

Students majoring in plant breeding will ordinarily find it necessary to remain in Ithaca during the summer, or to make satisfactory arrangements for growing and studying elsewhere the plant materials used in connection with their research problems. Since the department has accommodations for only a limited number, prospective students will find it to their advantage to correspond with a member of the departmental staff some months prior to entering upon their work.

101. *Genetics*. First term. Four hours a week.

103. *Plant Breeding*. Second term. Three hours a week.

150. *Special Problems*. First or second term. One or two hours.

201. **Advanced Genetics.** Second term. Prerequisites, course 101 and Botany 124. Professor ————. M F 8–10. Plant Science 146. Laboratory work to be arranged. Laboratory fee, $3; deposit, $2.

Group discussions of advanced principles of genetics, with special attention to methods of analysis as illustrated in problems on both hypothetical and experimental data. Laboratory studies on the artificial production of mutations in Drosophila by means of X-rays, with as complete a genetic analysis of these as time permits.

211. **Statistical Methods of Analysis.** First term. Associate Professor LIVERMORE. Th 1:40–4. Plant Science 233. Laboratory fee, $2.

A discussion of statistical methods for the study of variation, correlation, curve fitting, experimental error, the analysis of variance and covariance; and the application of these methods to problems in biology and related fields.

212. **Special Problems in Statistical Methods.** Second term. Non-credit course. Limited to graduate students who have had course 211 or similar work. Professor LOVE. Hours to be arranged.

A conference course dealing with the problems of plot technique and related topics, such as the design of experiments and interpretation of results.

Seminary. Second term. Professors LOVE, MYERS, BUSSELL, WIGGANS, and LIVERMORE, and Drs. DORSEY and MURRAY. W 11. Plant Science 404.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

Research in fruit breeding problems is also available at Geneva. For further information see page 199.

PLANT PATHOLOGY

Professors L. M. MASSEY, H. H. WHETZEL, DONALD REDDICK, M. F. BARRUS, H. M. FITZPATRICK, CHARLES CHUPP, W. H. BURKHOLDER, F. M. BLODGETT, D. S. WELCH, K. H. FERNOW, A. G. NEWHALL, W. D. MILLS, C. E. F. GUTERMAN, A. B. BURRELL, E. M. HILDEBRAND, K. G. PARKER, V. L. FRAMPTON, F. A. HAASIS, A. W. DIMOCK, and L. J. TYLER; at Geneva, *Professors* O. A. REINKING, G. L. MCNEW, W. O. GLOYER, J. M. HAMILTON, H. S. CUNNINGHAM, R. O. MAGIE, D. H. PALMITER, and R. F. SUIT.

Approved Major and Minor Subjects (key to symbols on p. 41)

Mycology 1, 2, 3, 4
Plant Pathology 1, 2, 3, 4

The laboratories of the department are fully equipped for teaching and research in this subject. Many pieces of apparatus for use in connection with specialized research problems are available and additional apparatus can be supplied whenever it is needed. Greenhouses having about 12,000 square feet of floor space afford facilities for experimental work and for the culture of diseased and healthy plants for class use. These houses are divided into compartments so that various artificial conditions of temperature and moisture can be maintained for diverse types of plants and kinds of experimental work. Field laboratories in important crop sections of the State are maintained through co-operation with growers. These laboratories provide certain graduate students who receive fellowships (several of which are usually available each year) with an opportunity of pursuing investigations on a large scale under most favorable commercial conditions.

The pathological herbarium includes a local collection of fungi and pathological materials and sets of well-known fungous exsiccati. The library contains most of the important works on plant pathology, mycology, and bacteriology, complete sets of the more important journals, many monographs, and practically all the experiment station literature on these subjects.

Candidates for the Doctor's degree should spend at least one season in the field in order to come into contact with the practical aspects of control problems. Students preparing for graduate work in plant pathology are urged to obtain a thorough knowledge of elementary physics and chemistry, including organic and physical chemistry, and of general botany, plant histology, and plant physiology. A reading knowledge of French and German is indispensable in phytopathological research and must be acquired before the beginning of the third semester of graduate work. Candidates for advanced degrees must have fundamental training in the subjects enumerated above. Opportunity is afforded for further study in these subjects after entering the Graduate School, but a student availing himself of this opportunity can not expect to receive a degree in the minimum amount of time required for residence. Members of the staff are prepared to direct investigation in the various sub-divisions of the broader field. It is urged that prospective students correspond with a member of the departmental staff some months in advance of the time when they expect to enter upon their work.

1. *Elementary Plant Pathology.* First or second term. Professors WHETZEL and WELCH and Assistant Professor L. J. TYLER. One lecture and two laboratories each week. For credit of 3 hours. This course is also offered during the six-week Summer Session.

200. **General Plant Pathology.** First term. For graduate students with their major or a minor in Plant Pathology. Open also to qualified graduate students in other fields. Prerequisite, permission to register. Professors WHETZEL and WELCH, and Assistant Professor TYLER. Lecture, T 11. Plant Science 336. Practice, three 3-hour periods weekly at the students' convenience. Laboratory fee, $4.50; breakage deposit, $5.

A course designed to give the entering graduate student an introduction to the basic features and techniques of the science of phytopathology and to provide an adequate foundation for successful prosecution of research in this field.

2. **Principles of Plant Disease Control.** First term. Professor WHETZEL and Assistant Professor TYLER. Lecture, Th 8. Plant Science 336. Practice, T Th 1:40–4. Plant Science 342. Laboratory fee, $4.50; breakage deposit, $5.

A consideration of the principles and methods in plant disease control. Required of all graduate students.

201. **Advanced Plant Pathology.** First and second terms. Professor MASSEY and Assistant Professor HILDEBRAND. Lecture, T 9. Plant Science 336. Practice, T Th 10–12:30. Plant Science 304. Laboratory fee, $4.50; breakage deposit, $3.

A presentation and analysis of the experimental and empirical knowledge of plant diseases. The phenomena of inoculation, incubation, infection, susceptibility, and host reactions are critically considered.

111. **Diseases of Trees and Shrubs.** Second term. Prerequisite, course 1 or 200. Professor WELCH. Lecture, F 10. Plant Science 336. Practice, T Th 1:40–4. Plant Science 362. Laboratory fee, $4; breakage deposit, $3.

A course dealing with the diseases peculiar to woody plants, their recognition and treatment.

[121. **Comparative Morphology of Fungi.** Second term. Prerequisite, Botany 1 or the equivalent. Professor FITZPATRICK. Lecture, M W 11. Plant Science 336. Practice, M W 1:40–4. Plant Science 329. Laboratory fee, $6; breakage deposit, $3. Given in alternate years, not in 1942–43.]

A synoptical course designed to acquaint the beginning student with the general field of mycology. Emphasis will be placed on morphology and phylogeny, rather than on taxonomy.

221. **Mycology.** First and second terms. Prerequisite, Botany 1 or the equivalent. Professor FITZPATRICK. Lecture, M W 11. Plant Science 336. Practice, M W 1:40–4 and one additional period to be arranged. Plant Science 329. Laboratory fee, $6; breakage deposit, $5. Given in alternate years.

An intensive study of the morphology and taxonomy of the fungi.

[222. **Mycology.** First term. Prerequisite, Botany 1 or the equivalent. Professor FITZPATRICK. Lecture, M W 11. Plant Science 336. Practice, M W 1:40–4 and one additional period to be arranged. Plant Science 329. Laboratory fee, $6; breakage deposit, $5. Given in alternate years, not in 1942–43.]

Covers the Basidiomycetes, including rusts and smuts. Supplements and alternates with course 221.

231. **History of Plant Pathology.** First and second terms. Requires a reading knowledge of French and German. Professor WHETZEL. Designed especially for graduate students specializing in Plant Pathology.

241. **Research.** Professors MASSEY, WHETZEL, REDDICK, BARRUS, FITZPATRICK, CHUPP, BURKHOLDER, BLODGETT, WELCH, FERNOW, NEWHALL, MILLS, GUTERMAN, BURRELL, HILDEBRAND, PARKER, FRAMPTON, HAASIS, DIMOCK, and TYLER.

242. **Seminary.** Members of the staff. Weekly.

243. **Literature Review.** Members of the staff. Bi-weekly.

PHYSICAL SCIENCES

ASTRONOMY

Professors S. L. BOOTHROYD and R. W. SHAW.

Approved Major and Minor Subjects (key to symbols on p. 41)

Astronomy 1, 2, 4
Astrophysics 1, 2, 4

Candidates for the degree of Doctor of Philosophy in Astronomy or Astrophysics will be required to take one minor in Physics unless a divided major is granted. In special cases a major in Astronomy or Astrophysics may consist partly of selected courses in Physics. In such cases one minor need not be in Physics.

Candidates for the degree of Doctor of Philosophy, Master of Arts, or Master of Science with major or minor in Astronomy or Astrophysics will be required to offer for admission the equivalent of Astronomy 187 and Astronomy 182 or 183.

Those electing a minor in the department may select such courses as meet their requirements provided the necessary prerequisites are offered.

Students with advanced training in physics, chemistry, or mathematics, but not desiring a major or minor in astronomy, may be admitted after consultation with the professor in charge to such courses in astronomy as may seem desirable.

For work in Practical Astronomy, the Observatory equipment includes a 12-inch equatorial by Brashear; an astronomical transit and a theodolite having circles read to seconds by micrometer miscroscopes, both by Troughton and Simms; an astronomical transit and zenith telescope by Fauth; a Howard Sidereal Clock; chronographs and photographic equipment as well as smaller instruments. In addition, the Geodetic equipment includes a Mendenhall Half-second Pendulum Apparatus of the pattern once used in the United States Coast and Geodetic Survey.

A sub-station of the Fuertes Observatory is located on the grounds of the Arizona State Teachers College at Flagstaff, Arizona. The equipment consists of an 8-inch Schmidt Camera of focal ratio f 1.5. The department has under construction a 24-inch reflecting telescope which is to be erected at the Arizona station for the study of ultra-violet stellar spectra. As auxiliary equipment a two-prism quartz spectrograph has been constructed.

In addition to the Observatory and its equipment the Astronomy Department has a laboratory for elementary instruction, an astrophysics laboratory, five dark rooms, a department library and two offices in Rockefeller Hall.

Fields of investigation in which members of the staff are particularly interested in directing research are as follows:

Professor BOOTHROYD, in geodetic astronomy and meteoric astronomy.
Assistant Professor SHAW, in astrophysics.

180, 181. *Introductory Astronomy.* Three hours a week.

182. *Field Astronomy.* Two hours a week.

183. *Navigation and Nautical Astronomy.* Three hours a week.

186. *Geodetic Astronomy.* Three hours a week.

187. *Advanced Astronomy.* Throughout the year. Three hours a week.

189. *Informal Study.* One to three hours a week.

190. **Astrophysics.** Throughout the year. Credit three hours a term. Prerequisites, Astronomy 187 and Mathematics 6 or their equivalents. Assistant Professor SHAW.

A detailed study of present-day problems and progress in planetary, stellar, and nebular structure and constitution.

[191. **Theoretical Astrophysics.** Throughout the year. Credit three hours a term. Prerequisites, Astronomy 190 and Mathematics 41. Assistant Professor SHAW. Not given in 1942–43.]

Theoretical interpretation of the internal constitution of stars, theory of line contours, radiative transfer in stellar envelopes, and special problems.

195. **Astrophysics Laboratory.** Throughout the year. Credit variable. Prerequisite, Physics 105 or consent of the instructor. Assistant Professor SHAW. Rockefeller 358.

The student will be given opportunity to familiarize himself with techniques involved in obtaining, reducing, and evaluating data of astrophysical interest. Attention is also given to the general problem of precision measurement of optical radiation without regard to astrophysical application. The laboratory work may be accompanied by lectures on method and technique.

[196. **Problems in Practical Astronomy.** Throughout the year. Credit three hours a term. Prerequisite, Astronomy 186. Not given in 1942–43.]

Theoretical and practical work in precision astronomy including stellar positions, photographic parallaxes, proper motions, double stars, geodetic positions, gravity determinations, and isostasy. Investigation of instrumental errors and the determination of observational errors by methods of least squares.

[197. **Theoretical Astronomy.** Throughout the year, Credit three hours a term. Prerequisite, consent of the instructor. Not given in 1942–43.]

The study of celestial mechanics, orbital theory, tidal theory, theory of rotating fluids and internal structure of planets and stars. The content of the course will be chosen to meet the needs of the student.

199. **Advanced Study and Research.** Either term or throughout the year. Credit variable. Assistant Professor SHAW and staff.

Extended study or research in subjects similar to those noted in Astronomy 189 (see catalogue of College of Arts and Sciences) or others selected with the consent of the instructor. Upon sufficient demand work may be given formally.

CHEMISTRY

Professors PETER DEBYE, A. W. BROWNE, T. R. BRIGGS, JACOB PAPISH, J. R. JOHNSON, C. W. MASON, M. L. NICHOLS, A. W. LAUBENGAYER, J. G. KIRKWOOD, W. F. BRUCE, J. L. HOARD, F. A. LONG, and W. T. MILLER. *Doctors* R. B. EATON, HENRY TAUBE, and S. H. BAUER.

Approved Major and Minor Subjects (key to symbols on p. 41)

Inorganic Chemistry 1, 2, 3, 4
Analytical Chemistry 1, 2, 3, 4
Organic Chemistry 1, 2, 3, 4
Physical Chemistry 1, 2, 3, 4

A graduate student who desires to take either a major or a minor subject in chemistry should select any one of the above branches.

A prospective graduate student is strongly advised to communicate, when applying for admission, with a member of the faculty in the branch of Chemistry in which he wishes to have his major subject. In general, members of the Special Committee should be chosen from different fields of Chemistry. It is desirable that candidates for the degree of Doctor of Philosophy select at least one minor subject outside of chemistry.

A graduate student who desires to take a minor subject in chemistry with some field other than chemistry as the major subject, will be required to offer introductory courses in inorganic chemistry, qualitative analysis, and quantitative analysis as preliminary to his graduate study. The work upon his minor subject in chemistry may be taken in any branch of the subject that he is qualified to pursue, and may comprise advanced courses selected from the subjoined list, with the approval of his Special Committee.

Graduate students intending to teach chemistry in secondary schools are advised to confer with the departmental Graduate Scholarship Committee regarding preparation for this work.

Candidates for the degree of Master of Arts, Master of Science, or Doctor of Philosophy, with major in Chemistry will be required to offer for admission the

equivalent of Introductory Inorganic Chemistry 102 and 104; Qualitative Analysis 205 and 206, or 210; Quantitative Analysis 220 and 221, or 225; Introductory Organic Chemistry 305 and 310 (one term); Introductory Physical Chemistry 405, and 410 (one term); they must also present the equivalent of two units of German.

Candidates for the degree of Doctor of Philosophy with major in Chemistry must have completed, before the beginning of the last year of residence, the equivalent of Advanced Quantitative Analysis 230, Introductory Organic Chemistry Laboratory 310 (second term), and Introductory Physical Chemistry Laboratory 410 (second term). Graduate students entering from approved universities may take, during their residence for the advanced degree, such of these required courses as they have not already pursued. If a graduate student lacks at entrance several of these preliminary courses, more than the minimum period of residence may be necessary.

Every candidate is required to pass a departmental Qualifying Examination. This examination will comprise tests in the following four Divisions of Chemistry: (A) Inorganic and General, (B) Analytical, (C) Organic, and (D) Physical. The individual tests, each consisting of a written examination covering a period of two or three hours, will be given in the fall, on days set by the Committee on Qualifying Examinations. All students entering candidacy for the doctorate in chemistry are expected to take them at the time announced.

Successful completion of these examinations will show that the candidate is qualified to proceed in his graduate training at once. Failure in one or more of the examinations will necessitate thorough review of the work in elementary courses and satisfaction of the staff members of the Division concerned before the end of the first semester. The special committee of any candidate who has not thus given satisfactory evidence that he is qualified to proceed may refuse to allow him to continue for a second term as a candidate for the Ph.D. degree in Chemistry.

After the candidate has completed his minor subjects, he will be required to pass a general examination, both written and oral, on his major and minor subjects. Upon recommendation of the candidate's Special Committee, this examination may be taken toward the end of the term preceding his last year of residence. This procedure makes it possible for the candidate to devote his last year of residence to uninterrupted research on his thesis. At the close of his period of residence, and after the acceptance of his thesis, the candidate will be required to pass a final oral examination on the thesis and on related subjects.

As an alternative procedure, the general examination on major and minor subjects and on the thesis may be taken after the acceptance of the thesis.

Graduate students are required to register with the Department of Chemistry on the registration days at the beginning of each term. Entering students must consult with the chairman of the departmental Graduate Scholarship Committee at this time.

For a more detailed description of the courses in the various branches of chemistry, see the Announcements of the Colleges of Arts and Sciences and of Engineering.

All courses in Chemistry are open to properly qualified graduate or undergraduate students. It may be necessary for a graduate student in chemistry to take one or more of the courses designated by italics as primarily for undergraduates, either as prerequisite to his graduate work or as an essential part of his major and minor subjects.

Fellowships and scholarships are ordinarily awarded only for the last year of residence for the Doctorate. Teaching assistantships are open to entering graduate students.

All courses listed below are to be given in the Baker Laboratory of Chemistry.

Inorganic Chemistry

102. *General Chemistry.* Throughout the year. Credit three hours a term. Open only to students who have not had chemistry.

104. *General Chemistry.* Throughout the year. Credit three hours a term. For students who have had a course in chemistry.

130. **Advanced Inorganic Chemistry.** Throughout the year. Credit three hours a term. Prerequisite or parallel courses, Chemistry 405 or 406. Professor LAUBENGAYER. M W F 11. Baker 107.

The elements are discussed in the order in which they appear in the Periodic System, with special attention to the bearing of atomic structure on the properties of elements and their compounds and on the relations between the group. The less familiar elements are treated in detail and the stereo-chemistry of inorganic substances is considered.

135. **Advanced Inorganic Chemistry.** Either term. Credit two to six hours. Prerequisites, Chemistry 305 and 310. Professors BROWNE and LAUBENGAYER and assistants. Day and hour to be arranged. Baker 178 and 122.

Laboratory practice. The preparation, purification, properties, and reactions of inorganic compounds including those of the rarer elements.

Chemistry 135 is designed to accompany Chemistry 130, but either course may be taken separately.

140. **Selected Topics in Advanced Inorganic Chemistry.** Second term. Credit two hours. Prerequisites, Chemistry 405 and 410, or special permission. Professor BROWNE. W F 9. Baker 107. Given in alternate years.

[165. **Chemistry of the Rare Elements.** Second term. Credit two or more hours. Prerequisite, Chemistry 130. Professor PAPISH and assistant. Hours to be arranged. Baker 318. Not given in 1942–43.]

Laboratory practice. Extraction, recovery, and purification of the rare elements, and preparation of their salts. Chemical analysis of the rare elements.

195. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

ANALYTICAL CHEMISTRY

201. *Introductory Analytical Chemistry.* First term. Credit four hours.

203. *Introductory Qualitative Analysis.* Second term. Credit five hours.

205. *Introductory Qualitative Analysis.* First term. Credit three hours.

206. *Introductory Qualitative Analysis.* First term. Credit three hours.

210. *Introductory Qualitative Analysis.* Shorter course. Repeated in the second term. Credit three hours.

220. *Introductory Quantitative Analysis.* Repeated in the second term. Credit three hours.

221. *Introductory Quantitative Analysis.* Repeated in the second term. Credit three hours.

225. *Introductory Quantitative Analysis.* Shorter course. Repeated in the second term. Credit three hours.

230. *Advanced Quantitative Analysis.* Second term. Credit three hours.

235. **Advanced Quantitative Analysis.** Second term. Credit two hours. Prequisite, first term of Chemistry 405. Professor NICHOLS. M W 12. Baker 207. Given in alternate years.

A theoretical discussion of selected topics in quantitative analysis including sampling, indicators, potentiometric and conductometric titrations, together with the development and present status of various analytical methods.

250. *Gas and Fuel Analysis.* Either term. Credit three hours.

270. **Special Methods of Quantitative Analysis.** Either term. Credit two or more hours. Prerequisites, Chemistry 230 and 235. Professor NICHOLS and assistants. Day and hour to be arranged. Baker 277.

Laboratory practice in the application of special methods such as indirect analysis, conductometric and potentiometric titrations, etc., to quantitative analysis and the analysis of special materials. The study of the important methods and special forms of apparatus used in scientific gas analysis. Electrochemical methods for the determination of silver, lead, copper, tin, nickel, cobalt, zinc, iron, etc.; the analysis of alloys and ores.

Within certain limits the work may be selected to suit the requirements of the individual student.

275. **Quantitative Microanalysis.** First term. Credit three or more hours. Prerequisites, course 230 and special permission. Professor NICHOLS. Hours to be arranged. Baker 358.

Laboratory practice in typical methods of both organic and inorganic quantitative microanalysis.

280. **Emission Spectroscopy in Chemical Analysis.** First term. Credit variable. Prerequisite, special permission. Professor PAPISH and Dr. BAUER. Laboratory hours to be arranged. Baker 396. Conference, to be arranged. Fee, $15.

The construction and use of spectroscopic equipment; spectrum excitation; qualitative and quantitative spectrochemical analysis.

295. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

ORGANIC CHEMISTRY

305. *Introductory Organic Chemistry.* Throughout the year. Credit six hours.

310. *Introductory Organic Chemistry.* Throughout the year. Credit three hours a term.

315. **Advanced Organic Chemistry.** Throughout the year. Prerequisites, Chemistry 305, 310, and 340, or the consent of the instructor. Professor JOHNSON, Assistant Professors BRUCE and MILLER. T Th 9. Baker 177.

Lectures. First term, survey of the more important classes of organic compounds and their reactions. Second term, discussion of general topics (tautomerism, molecular rearrangements, stereochemistry). Students may register for either term separately.

320. **Advanced Organic Chemistry.** Either term. Credit two to six hours a term. Prerequisites, Chemistry 305 and 310. Professor JOHNSON, Assistant Professors BRUCE and MILLER, and assistants. Day and hour to be arranged. Baker 208. Conference, F 12. Baker 206.

Laboratory practice. An advanced course in the preparation of organic compounds. The original literature is consulted, and the student is required to repeat some extended and important piece of work, and to compare his results with those published.

325. **Special Topics in Organic Chemistry.** Second term. Credit two hours. Prerequisite, Chemistry 315 or 340. Professor JOHNSON and Assistant Professor MILLER. M W 11. Baker 207. Given in alternate years.

Lectures. A presentation and discussion of special fields and current theories of organic chemistry. The topics will be: Organic chemistry of nitrogen and sulfur, and heterocyclic compounds.

330. **Chemistry of High-polymers.** First term. Credit two hours. Prerequisite, Chemistry 315 or 340, and 405 or 406. Assistant Professor MILLER. M W 11. Baker 207. Given in alternate years.

The mechanism and kinetics of polymerization processes and the chemical structure and reactions of high-polymers will be discussed, with examples chosen from the more significant natural and synthetic high molecular weight materials.

[335. **Physical Aspects of Organic Chemistry.** First term. Credit two hours. Prerequisite, Chemistry 315 or 340. Professor JOHNSON and Assistant Professor MILLER. M W 11. Baker 207. Given in alternate years, not in 1942–43.]

340. **Identification of Organic Compounds.** Second term. Credit three hours. Prerequisites, Chemistry 305 and 310 and consent of the instructor. Assistant Professor MILLER and assistants. Lectures and conferences. T Th 10. Baker 206. Two laboratory periods, M T W or Th 1:40–4. Baker 350.

The classification reactions of organic compounds and the preparation of solid derivatives are applied to the identification of unknown organic substances.

[345. **Biochemical Aspects of Organic Chemistry.** Second term. Credit two hours. Prerequisite, Chemistry 315 or 340. Professor BRUCE. T 4:15. Baker 204. Given in alternate years, not in 1942–43.]

A discussion of the organic chemistry of natural products, including plant and animal pigments, Vitamins, Hormones, etc.

375. *Elementary Organic Chemistry.* Either term. Lectures and laboratory, six hours credit. For students preparing for the study of medicine.

395. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

Physical Chemistry

[401. *Principles of Physical Chemistry.* Throughout the year. Credit three hours a term. Lectures and laboratory. Primarily for students in the biological sciences. Not given in 1942–43.]

405. *Introductory Physical Chemistry.* Throughout the year. Credit three hours a term. Lectures.

It is advisable, but not obligatory that course 410 accompany this course.

406. *Physical Chemistry.* Throughout the year. Credit three hours a term. Lectures.

410. *Introductory Physical Chemistry.* Throughout the year. Credit three hours a term. Prerequisite or parallel course, Chemistry 405 or 406. Laboratory practice and recitations.

If one term only is taken, registration for the second term is advised.

420. **Advanced Physical Chemistry.** First term. Credit three hours. Prerequisite, Chemistry 405. Assistant Professor Hoard. Lectures and recitations. M W F 12. Baker 7.

Exposition of the principles of physical chemistry from the mathematical standpoint, with emphasis on the solution of simple problems.

425. **Applications of the Phase Rule.** First term. Credit two hours. Prerequisite, Chemistry 405 or an elementary knowledge of the phase rule as applied to systems of one and two components. Professor Briggs. Lectures: T Th 11. Baker 7.

The study and interpretation of typical phase diagrams, especially in systems of two and three components, followed by a brief treatment of systems containing four or more components. Special attention will be given to metal alloy diagrams, to equilibria in saturated salt solutions, and to the problem of indirect analysis. Given in alternate years.

[430. **Colloid Chemistry.** Throughout the year. Credit two hours a term. Prerequisite, Chemistry 405 or 406. Professor Briggs. Lectures: T Th 10. Baker 7. Given in alternate years, not in 1942–43.]

First term: the properties of surfaces, including the adsorption of gases by solids, adsorption from solutions, liquid films, and contact catalysis. Second term: general properties of colloidal solutions and suspensions.

435. **Chemistry of Solids.** Second term. Credit three hours. Prerequisite or parallel courses, Chemistry 405 or 406, or special permission. Assistant Professor Hoard and Professor Mason. Hours to be arranged. Given in alternate years.

A general discussion of the formation and growth of metallic and chemical crystals, their physical and chemical behavior, and the relationships between lattice structure and chemical constitution.

[440. **Molecular Spectra.** First term. Credit three hours. Open to qualified students by permission. Dr. Bauer. Hours to be arranged. Given in alternate years, not in 1942–43.]

Brief review of atomic spectra. Description of the various types of molecular spectra; the rotation and vibration of diatomic molecules, electronic states, and electronic transitions. A résumé of continuous and diffuse molecular spectra with reference to the subject matter considered in photochemistry. Normal coordinate treatment of the vibrations of polyatomic molecules and the analysis of their Raman and infra-red absorption spectra. Discussion of the relations between molecular structure and molecular constants.

445. **Introductory Electrochemistry.** Second term. Credit three hours. Lectures and laboratory. Prerequisite, Chemistry 405 or 406. Deposit, $15. Professor Briggs and assistant. Lectures: M W 12. Baker 7. Laboratory: hours to be arranged following first lecture. Baker 1A.

Theory of electrolysis and of the voltaic cell, including theory and practice of electromotive force measurements, transference, ion activities, and oxidation-reduction.

450. **Applied Electrochemistry.** First term. Credit three hours. Prerequisite, Chemistry 405 or 406. Professor BRIGGS. Lectures: M W F 11. Baker 7.

Elementary theory of electrolysis and electromotive force. Electrolytic refining and extraction of metals: electroplating; electrolytic preparation of organic and inorganic compounds; electrothermal electrolysis; storage cells; brief survey of electrothermics. By electing Course 465 (one or more hours), the student may obtain laboratory practice in many of the subjects which are presented in the lectures. Given in alternate years and provided at least six students register for the course.

[455. **Kinetics of Chemical Reactions.** Second term. Credit two hours. Prerequisite, Chemistry 405. Assistant Professor LONG. Hours to be arranged. Given in alternate years, not in 1942–43.]

A general discussion of rates of reaction including: types of reactions, methods of measurement, theories of reaction rates, application to problems.

460. **Chemical Physics.** Second term. Credit three hours. Open to seniors and graduate students majoring in chemistry or physics. Professor DEBYE. M W F 10.

An elementary presentation of the principles involved in describing the structure and behavior of matter; atomic structure and the periodic table; interatomic forces; structure of solids; electrons in metals; temperature equilibrium and statistics.

465. **Advanced Laboratory Practice in Physical Chemistry.** Either term. Credit variable, but not to exceed six hours a term. Prerequisite, determined in each case by the professor in charge. Professors BRIGGS and KIRKWOOD, Assistant Professor HOARD, and assistants. Hour and place to be arranged.

470. **Thermodynamics.** Throughout the year. Credit three hours a term. Prerequisites, Chemistry 405 or 406, or special permission. Professor KIRKWOOD. M W F 9.

Development of the general equations of thermodynamics from the first and second laws. Exposition of the concepts of entropy and free energy. Applications to the study of physico-chemical equilibria in gases, liquids, solids, and liquid solutions. Problems.

[475. **Theory of Solutions.** First term. Credit three hours. Prerequisite, Chemistry 470. Professor KIRKWOOD. M W F 12. Given in alternate years, not in 1942–43.]

Exposition of modern theories of electrolyte and non-electrolyte solutions. Presentation of the Debye-Hückel theory and the calculation of the thermodynamic functions of electrolyte solutions from interionic forces. The Bjerrum theory of ion association. Correlation of the properties of non-electrolyte solutions with molecular distribution and intermolecular forces. Discussion of transport phenomena in solution including electrolytic conductance, diffusion, and viscous flow.

480. **Statistical Mechanics.** Second term. Credit three hours. Prerequisite, first term Chemistry 470. Professor KIRKWOOD. Given in alternate years.

Exposition of the equilibrium theory of statistical mechanics from the standpoint of the Gibbs canonical ensemble. Mechanical interpretation of the principles of thermodynamics, with application to simple thermodynamic systems.

[490. **Introductory Quantum Mechanics with Chemical Applications.** Second term. Credit three hours. Open to qualified students by permission. Professor KIRKWOOD. Hours to be arranged. Given in alternate years, not in 1942–43.]

Elementary presentation of the principles of quantum mechanics. Development of the basic ideas underlying the quantum mechanical theory of the chemical bond.

495. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

Chemical Microscopy and Metallography

530. *Introductory Chemical Microscopy.* Repeated in the second term. Credit three hours. Prerequisite, Physical Chemistry.

535. **Microscopical Qualitative Analysis (Inorganic).** Either term. Credit two or more hours. Prerequisite, Chemistry 530. Professor Mason and assistants. Laboratory periods, to be arranged. Baker 378.

Laboratory practice in the examination and analysis of inorganic substances containing the more common elements with special reference to rapid qualitative methods and to the analysis of minute amounts of material.

540. **Microscopical Methods in Organic Chemistry.** Either term. Credit two or more hours. Prerequisites, Chemistry 530 and special permission. Professor Mason and assistants. Day and hour to be arranged. Baker 378.

Laboratory practice. General manipulative methods applicable to small amounts of material, crystallization procedures, determination of melting points and molecular weights; chemical tests and reactions for elements, radicals, and various types of organic compounds. Preparation of simple derivatives.

545. **Metallography.** First term. Credit three hours. Prerequisite, Chemistry 405, or Engineering 3X31 as a parallel course, or special permission. Professor Mason and assistants. Lectures, T Th 10. Laboratory, M T or Th F 1:40–4. Baker 384.

Micro structures of alloys, as related to composition, thermal history, and physical properties, and explained in terms of general crystallographic phenomena. Preparation of specimens and principles and use of metallographic microscopes.

550. **Advanced Metallography.** Second term. Lectures, credit two hours. Laboratory optional, credit one or more hours. Prerequisites, Chemistry 545 and consent of the instructor. Professor Mason. Baker 377 and 384. Laboratory fee variable.

Lectures, conferences, and reports on various topics in physical metallurgy. Laboratory work, arranged in accordance with the interests of the student, covering heat treatment and structures of ferrous or non-ferrous alloys, or minor research problems.

565. **Special Methods in Chemical Microscopy.** Either term. Credit one or more hours. Prerequisite, special permission. Professor Mason. Day and hour to be arranged. Baker 378 and 382.

Laboratory practice may be elected in various fields such as photomicrography, ultramicroscopy, crystal studies, micro-manipulations, quantitative determinations, and the microscopy of industrial materials, pigments, textiles, papers, and foods.

595. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

Special Topics

910. **Special Topics in Chemistry.** First term. Credit one hour. Professors Mason and Rhodes. T 11. Baker 207.

The use of chemical literature; patent law; and other special topics. Graduate students are advised to take this course before beginning their thesis work.

[1000. **Non-Resident Lectures on the George Fisher Baker Foundation.** T Th 12. Baker 177.]

Non-Resident Lectureship

The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University was established early in the year 1926 by a gift from Mr. Baker, the income to be used by the University for the benefit and advancement of teaching and research in Chemistry and allied sciences. Under this plan the University invites eminent men of science to come to Cornell, each for one or two semesters, to present the most recent advances, and the methods and results of their own investigations, in the fields in which they have won distinction. A private office and a research laboratory are placed at the disposal of the Non-Resident Lecturer,

and he is thus enabled to carry forward investigational work while in residence at Cornell.

The Non-Resident Lecturers under the George Fisher Baker Foundation deliver two lectures a week, and hold a colloquium. In some cases they also conduct experimental research with a few advanced students.

The program for these lectures is to be announced.

Chemical Engineering and Industrial Chemistry

For the announcement of courses in Chemical Engineering and Industrial Chemistry, see Chemical Engineering, page 152.

Biological Chemistry

See under Animal Sciences, p. 81.

Research at the New York State Experiment Station

Research work in agricultural and food chemistry is also offered at Geneva For further information see page 197.

GEOLOGY AND GEOGRAPHY

Professors O. D. von Engeln, C. M. Nevin, A. L. Anderson, J. D. Burfoot, jr., and C. W. Merriam.

Approved Major and Minor Subjects (key to symbols on p. 41)

Regional Geography 1, 2
Mineralogy 1, 2, 3, 4
Economic Geology 1, 2, 3, 4
Paleontology 1, 2, 3, 4
Petrology 1, 2, 3, 4
Metamorphism 1, 2, 3, 4
Geomorphology 1, 2, 3
Glacial Geology 1, 2, 3, 4
Structural Geology 1, 2, 3, 4
Stratigraphy 1, 2, 3, 4
Sedimentation 1, 2, 3, 4
Commercial Geography 4
Physical Geography 2, 3, 4
Geology 4
Geography 4

Under the general title of geology are included dynamic and structural geology, physical, regional, and economic geography, geomorphology, glaciology, mineralogy, crystallography, petrology, paleontology and stratigraphic geology, and economic geology.

Graduate work in Geology may include, in addition to work done in Ithaca, the opportunity to spend part of the time in investigation under approved direction in the field away from Ithaca.

The University Library has a most extensive collection of private publications, magazines, and geological society transactions, as well as files of North American, European, and other geological survey reports. In the Geological Department there is the entire library of the late Professor H. S. Williams and a collection of over 60,000 authors' separates.

Special rooms are available for graduate students for carrying on research.

The department is provided with apparatus for different kinds of photographic work, and for polishing and sectioning ores, minerals, and rocks.

A. *General Geology and Physiography.* Throughout the year. Three hours a week.

100. *Introductory Geology.* Either term. Three hours a week.

Sedimentation and Structural Geology

Professor Nevin.

A student taking a major in this branch of geology must first have had at least elementary work in such other branches of geology as the professor in charge may prescribe.

102. **Structural Geology.** First term. Credit three hours. Prerequisite, Geology A. Professor Nevin. Lectures, M W 11. Laboratory, M 1:40.

Geologic structures and their causes. A basic course for all students majoring in this branch of geology.

103. **Sedimentation.** First term. Credit three hours. Prerequisite, Geology A. Professor Nevin. Lectures, M W 9. Laboratory, W 1:40.

The principles involved in the formation of sediments. Laboratory work consists of experimentation with sedimentary processes and field investigations.

502. **Petroleum Geology.** Second term. Credit three hours. Professor Nevin.

[503. **Petroleum Technology.** First term. Credit two hours. Professor Nevin. Not given in 1942–43.]

107. **Geologic Surveying.** Given in the summer field school. Credit six hours. Professor Nevin.

106. **Special Work in Structural Geology and Sedimentation.** Professor Nevin.

Directed reading and original investigation adapted to the needs of the student. Credit variable.

Geomorphology and Glacial Geology

Professor von Engeln.

The region around Ithaca affords excellent and varied illustrations of physiographic and glacial phenomena. For many years the teachers and advanced students of geomorphology and glacial geology have been engaged in investigation of the local field problems, and there is further opportunity of this kind. The main laboratory is well equipped with topographic maps and photographs; the collection of relief models is notably complete; and there is an experimental laboratory with apparatus and facilities for carrying on a variety of experiments in the development of land forms, etc. The work in this branch also includes an introductory course in economic geography. This, in correlation with physical geography and geomorphology, may be the preparation for advanced regional study and investigation. For teachers of Physical Geography in the secondary schools who wish to secure a Master's degree a definite program with a thesis subject appropriate to their needs has been outlined. Such work can be pursued in successive Summer Session terms.

200. **Geomorphology.** First term. Three hours a week. Prerequisite, Geology A. Professor von Engeln. Lectures, T Th 9. Laboratory, T 1:40. Physiography Laboratory, McGraw.

The technology of geomorphological description and interpretation of land forms with regard to process and stage and the adjustment of topography to structure. The precepts of the German school are given consideration.

206. **Commerical Geography.** Second term. Three hours a week.

205. **Glaciers and Glaciation.** Second term. Credit three hours. Prerequisite, Geology A. Professor von Engeln. Lectures, T Th 9. Laboratory, T 1:40. Physiography Laboratory, McGraw.

Living glaciers and the phenomena of the glacial period. One or more Saturdays devoted to all-day excursions in the spring. Mapping and interpretation of glacial deposits.

208. **Advanced Physiography and Regional Geography.** Both terms. Prerequisites, an adequate background of course work in geology, especially in physiography and related subjects. Professor von Engeln. Hours by arrangement. Physiography Laboratory.

Particular problems, especially those of glaciology and the relation of geological structure to topography and physiographic history. In general students with a minor in physiography are expected to undertake work in this course.

209. **Seminar.** First or second or both terms. Prerequisites, as for course 208. Professor VON ENGELN. Usually Monday afternoon 4. Physiography Laboratory.

Reviews of current literature or of the original literature on some topic within the field of this branch of the department.

MINERALOGY, CRYSTALLOGRAPHY, AND PETROLOGY

Assistant Professor BURFOOT.

The laboratory equipment is relatively good as regards petrographic microscopes, apparatus for chemical and physical investigations of rocks, and apparatus for special crystallographic determinations. There are also collections of rocks and study collections of minerals, including the Benjamin Silliman, jr., collection, acquired before the opening of the University in 1868.

Special graduate courses in this division are not offered, but advanced work is adapted to the needs of the individual. Some of the less special courses are, however, so dependent on a rather advanced knowledge of physics or chemistry or of both that they are to be considered as requiring the maturity of graduates, although open also to undergraduates with sufficient preparation.

Any bracketed course in this branch of the Department may be given in any year if it is desired by a sufficient number of students.

Each major and minor in this branch of the Department will be required to be familiar with such subjects and readings as the professor in charge may prescribe. These requirements will be adapted to the needs of the student and to the degree for which he is a candidate.

311. *Elementary Mineralogy.* Either term. Two lectures and one laboratory a week.

316. **Metamorphic Geology.** First term. Credit three hours. For advanced students. Prerequisite, permission of instructor. Registration with department before beginning of course required. Assistant Professor BURFOOT. T Th 12 and one additional period to be arranged. McGraw.

A general survey of the field of metamorphic geology with especial emphasis on processes and criteria. Metamorphic differentiation, the facies classification of metamorphic rocks, and retrogressive metamorphism are among the subjects considered. Special suites illustrating these phenomena are used.

317. **Optical Mineralogy.** First term. Credit three hours. Prerequisite, Geology 311. Registration with department before beginning of course required. Assistant Professor BURFOOT. Lectures, M Th 10. Laboratory, S 9–11:30. Mineralogy Laboratory, McGraw. Laboratory fee, $3.

The theory and use of the microscope in the determination and study of minerals and rocks. The commoner rock-forming minerals are studied in fragments and in thin-sections.

318. **Petrology.** Second term. Credit three hours. Prerequisite, Geology 317. Registration with department before beginning of course required. Assistant Professor BURFOOT. Lectures, T Th 10. Laboratory, F 9–11:30. Mineralogy Laboratory, McGraw. Laboratory fee, $3. Given in alternate years.

A consideration of the commoner kinds of igneous rocks, of various classifications used, and of the general principles of petrology including the origin of and the conditions under which igneous rocks are formed. In the laboratory, rock types are studied in thin-sections under the petrographic miscroscope.

[319. **Sedimentary Petography.** Second term. Credit three hours. Prerequisite, Geology 317. Registration with department before beginning of course required. Assistant Professor BURFOOT. Lectures, T Th 10. Laboratory, F 9–11:30. Mineralogy Laboratory, McGraw. Laboratory fee, $3. Given in alternate years, not in 1942–43].

The methods of investigating the mineral composition, texture, and other physical characteristics of sedimentary rocks, and some of the applications of these methods to geological problems.

320. **Advanced or Special Work in Mineralogy, Crystallography, or Petrology.**

Throughout the year. Credit variable. Prerequisite, variable. Assistant Professor BURFOOT. Day and hour to be arranged. McGraw.

Adapted to the needs of the individual student.

321. **Seminar.** Throughout the year. Credit one hour a term. Assistant Professor BURFOOT. M 4:15. Mineralogy Laboratory, McGraw. Given if desired by a sufficient number of students.

PALEONTOLOGY AND STRATIGRAPHIC GEOLOGY

Assistant Professor MERRIAM.

The University is so situated that excellent exposures of Devonian formations are at its very door, and the typical sections of New York State which are of fundamental importance in American Paleozoic geology are within short excursion range. The most important of these are the Rochester and Niagara gorges, Trenton Falls and the Helderberg escarpment, the Chemung Valley, and the coal fields of northern Pennsylvania.

Facilities are afforded to those desiring to study the later formations, since the department has collections made in the West Indies, Central and South America, as well as different parts of the United States and Europe. There is also the Newcomb collection (10,000 species) of recent shells; and a wealth of conchological literature in the geological and the general library.

401. *History of Life.* First term. Credit three hours.

492. **Stratigraphy.** First term. Credit three hours. Prerequisites, Geology 102, 103, 403. Assistant Professor MERRIAM. Lectures, M W F 12. Two week-end field trips of two days each to be arranged.

Consideration of the fundamental factors upon which stratigraphic correlation and nomenclature are based.

403. **Introductory Paleontology.** Throughout the year. Credit three hours a term. Prerequisite, Geology A. Assistant Professor MERRIAM. First term: lecture, T 10; laboratory, Th 1:40 and one additional period to be arranged. Second term: lecture, M 10; laboratory, M 1:40 and one additional period to be arranged.

406. **Paleontologic and Stratigraphic Problems.** Throughout the year. Credit variable. Prerequisite, 403. Assistant Professor MERRIAM. Conferences and reports to be arranged. McGraw 28.

An informal study course arranged to fit the needs of the student.

407. **Paleobotany.** Second term. One hour a week. Assistant Professor MERRIAM. Lecture, W 10.

ECONOMIC GEOLOGY

Associate Professor ANDERSON.

The work in economic geology is designed to familiarize the student with the origin, occurrence, and distribution of the mineral products of economic value, and also with the practical application of geological principles. The laboratory contains an excellent study collection of economic materials from the United States, Canada, Mexico, Europe, and Africa, including ores, fuels, clays, abrasives, building stones, etc., most of these representing suites of material collected by members of the staff of instruction on geological trips. This collection is supplemented by maps and models.

In addition to the collections, the economic geology laboratory has facilities for general work and research on economic materials; the equipment for metallographic work on ores is excellent.

The work of graduate instruction consists in part of lectures and in part of special work arranged to suit the needs of the individual student. Students who are registered for a major subject in economic geology are expected to engage in research, which should preferably be based on field work.

Excursions may readily be taken to the anthracite regions of Pennsylvania; to the iron, slate, cement, and talc regions near Easton, Pa.; to the metal mines of the Adirondacks, etc. Field trips of greater or less length are taken to some of these localities every year.

500. **General Economic Geology.** Throughout the year. Credit three hours a term. Associate Professor ANDERSON. Lectures, T Th 11. Laboratory or field trip, F 1:40. McGraw.

511. **Advanced or Special Work in Economic Geology.** Throughout the year. Credit variable. Prerequisite, dependent on the nature of the work. Associate Professor ANDERSON. Day and hour to be arranged. McGraw.

512. **Economic Geology Seminar.** Throughout the year. Associate Professor ANDERSON.

MATHEMATICS

Professors W. A. HURWITZ, W. B. CARVER, R. P. AGNEW, J. B. ROSSER, B. W. JONES, V. S. LAWRENCE, JR., W. W. FLEXNER, J. F. RANDOLPH, R. J. WALKER, and J. H. CURTISS; *Doctors* F. A. FICKEN, FRITZ HERZOG, MARK KAC, and JOSEPH LEHNER.

Approved Major and Minor Subjects (key to symbols on p. 41)

Algebra 1, 2, 3
Mathematical Analysis 1, 2, 3
Geometry 1, 2, 3
Applied Mathematics 1, 2, 3
Mathematics 1, 2, 4

If mathematics (as distinct from one of its subdivisions) is chosen as major subject, the minor subject or subjects must be chosen from some other field or fields of study.

It is recommended that when the major subject for the degree of Ph.D. is in the field of mathematics, at least one minor subject be chosen from some other field.

The graduate work provides instruction in the principal branches of mathematics and furnishes preparation and material for independent investigation. Only a portion of the whole field can be covered by the courses given in a single year. The courses are changed, therefore, from year to year in order to meet the needs of students.

In addition to the regular instruction, individual guidance and advice are offered to any student who wishes to follow a particular line of inquiry.

Students who take mathematics as a major subject for an advanced degree must have completed previously the equivalent of the elementary course in analytic geometry and calculus, and further study in at least one more advanced subject, as for example, differential equations, advanced calculus, modern algebra, or projective or advanced analytic geometry.

The Oliver Mathematical Club, composed of teachers and advanced students, meets weekly, and has for its object the systematic presentation by the members of some specified mathematical theory of recent development, and of reports on articles in current journals and on results of special reading and investigations. Discussion and reading groups or seminars are also frequently organized to meet other special interests, sometimes with the co-operation of teachers and students in fields other than Mathematics.

The equipment consists of a collection of about three hundred surfaces, including the various forms of the cyclides, the Kummer surface, the surface of centers, and minimum surfaces; plaster models illustrating positive, negative, and parabolic curvature, and constant measure of curvature; plaster models illustrating the theory of functions, among them models of simply and multiply connected surfaces, and of several forms of Riemann surfaces, and models representing the real parts of algebraic, exponential, logarithmic, and elliptic functions; wooden and glass models of crystals and polyhedra, wire and thread models of twisted curves and ruled surfaces, and skeleton frames for minimum surfaces.

The library has a large collection of books on pure and applied mathematics, including collected works of mathematicians, complete sets of all the important mathematical journals, transactions, and other publications of scientific societies, and doctoral theses from the leading American and European universities.

The Erastus Brooks Fellowship of $600 is awarded annually in the field of Mathematics. The fellowship is ordinarily awarded only to applicants who have had one year or more of graduate study.

The following courses are offered. The courses mentioned in brackets will not be given in 1942–43, but are given from time to time.

1. *Elementary Concepts of Mathematics.* Two terms. Three hours a week.
2. *Cryptanalysis.* First term. Three hours a week.
5. *Solid Geometry.* Either term. Three hours a week.
10. *College Algebra.* Either term. Three hours a week.
15. *Plane Trigonometry.* Either term. Three hours a week.
16. *Spherical Trigonometry and Map Projections.* Either term. Three hours a week.

[20. *Elementary Course in Higher Mathematics.* Two terms. Three hours a week. Not given in 1942–43.]

30. *Mathematics for Students of Economics and Statistics.* First term. Three hours a week.
50. *Analytic Geometry and Calculus.* Two terms. Three hours a week.
55. *Analytic Geometry and Calculus.* Two terms. Five hours a week.
60. *Analytic Geometry and Calculus.* Four terms. Three hours a week.
65a, b, c. *Analytic Geometry and Calculus.* Three terms. Three hours a week.
70. *Calculus.* Second term. Three hours a week.
90. *Teachers' Course.* Second term. Three hours a week.
224. *Engineering Mathematics.* Throughout the year. Three hours a week.

Algebra

133. **Determinants and Matrices.** First term. Prerequisite, Mathematics 65b or the equivalent. Associate Professor Jones. T Th S 11. White 121.

A treatment of such topics as determinants, matrices, linear dependence, linear equations, and linear transformations.

142. **Analytic Theory of Numbers.** Second term. Prerequisites, Mathematics 240 or 260. Dr. Lehner. M W F 12. White 211.

The course will stress the great diversity of methods which can be applied to the solution of problems in the theory of numbers. Topics will be selected from the following: Bernoulli numbers and polynomials, prime number theorem, partitions, lattice-point problem, Goldbach's theorem. No previous knowledge of number theory is required.

160. **Groups, Rings, and Fields.** Second term. Prerequisite, Mathematics 65b or the equivalent. Associate Professor Flexner. T Th S 11. White 123.

An elementary course dealing with the simpler theorems of group theory and their extension to rings and fields.

[**Symbolic Logic.** Not given in 1942–43.]

[**Theory of Numbers.** Not given in 1942–43.]

[**The Theory of Fields.** Not given in 1942–43.]

[**Foundations of Mathematics.** Not given in 1942–43.]

[**Modern Algebra.** Not given in 1942–43.]

[**Algebraic Numbers.** Not given in 1942–43.]

[**Theory of Equations.** Not given in 1942–43.]

[**Linear Algebras.** Not given in 1942–43.]

Analysis

200. **Elementary Differential Equations.** Either term. Prerequisite, Mathematics 65c or the equivalent. Dr. Ficken, first term. M W F 9. White 103. Dr. Herzog, second term. T Th S 11. White 221.

215. **Advanced Calculus.** Throughout the year. Prerequisite, Mathematics 65c or the equivalent. Assistant Professor Randolph. M W F 11. White 115.

A careful study of limits, continuity, derivatives and Riemann integrals. Functions of several variables. Multiple and line integrals. The course is designed to furnish necessary preparation for advanced work in analysis and applied mathematics.

221. **Measure and Integrals.** Second term. Prerequisite, Mathematics 215 or the equivalent. Dr. KAC. T Th S 10. White 211.

Elements of Lebesgue's theory of measure and integration. Riemann-Stieltjes and Lebesgue-Stieltjes integrals. Applications to orthogonal series, functional equations and statistical independence.

260. **Infinite Series.** First term. Prerequisite, Mathematics 65c. Professor HURWITZ. M W F 12. White 111.

The classical theory of convergent infinite processes, with an introduction to the theory of summability.

[**Real Functions.** Not given in 1942–43.]

[**Complex Variables.** Not given in 1942–43.]

[**Integral Equations.** Not given in 1942–43.]

[**Calculus of Variations.** Not given in 1942–43.]

[**Theory of Almost Periodic Functions.** Not given in 1942–43.]

GEOMETRY

310. **Projective Geometry.** Throughout the year. Prerequisite, Mathematics 65b or the equivalent. Professor CARVER. M W F 9. White 101.

A first course in projective geometry, including both synthetic and analytic methods.

361. **Differential Geometry.** First term. Prerequisite, Mathematics 65c or the equivalent. Assistant Professor WALKER. M W F 10. White 103.

The theory of curves and surfaces in Euclidean space of three dimensions, developed with the use of tensor calculus.

362. **Riemannian Geometry.** Second term. Prerequisite, Mathematics 361. Assistant Professor WALKER. M W F 10. White 103.

The theory of spaces with a metric defined by a definite or indefinite quadratic differential form. This course and Mathematics 361 will include an adequate treatment of tensor analysis.

[**Algebraic Curves.** Not given in 1942–43.]

[**Analytic Geometry of Space.** Not given in 1942–43.]

[**Topics in Topology.** Not given in 1942–43.]

[**Theory of Lattices.** Not given in 1942–43.]

[**Geometry of Hyperspace.** Not given in 1942–43.]

[**Tensor Analysis.** Not given in 1942–43.]

[**Non-Euclidean Geometry.** Not given in 1942–43.]

APPLIED MATHEMATICS

400. **Statistics.** Throughout the year. Prerequisite, Mathematics 30 or the equivalent. Assistant Professor CURTISS. T Th S 10. White 215.

A study of the theory underlying modern statistical analysis, and of practical applications of this theory. The course is designed to furnish a background for the various courses in applied statistics given in other departments.

410. **Numerical and Graphical Methods.** First term. Prerequisite, Mathematics 60d or 200 or the equivalent or Mathematics 215. Dr. KAC. T Th S 10. White 211.

Graphs, scales and alignment charts; analytical approximations to empirical curves; interpolation and extrapolation; mechanical quadratures; numerical and graphical solutions of algebraic, transcendental and differential equations. Applications to problems in chemistry, physics and engineering will receive special attention.

470. **Exterior Ballistics.** First term. Prerequisite, a course in differential equations (such as 60d or 200) or the equivalent. Associate Professor ROSSER. M W F 8. White 103.

A survey of the general principles of the theory of exterior ballistics followed by consideration of special topics. Considerable emphasis will be laid on numerical aspects such as computation of trajectories, etc.

480. **Partial Differential Equations of Mathematical Physics.** Throughout the year. Prerequisite, Mathematics 215. Professor AGNEW. T Th S 9. White 111.

The derivation of the differential equations, with appropriate boundary conditions, which arise in certain problems of mathematical physics; the mathematical properties of solutions, and the physical meanings of these properties.

[**Vector Analysis.** Not given in 1942–43.]

[**Fourier Series.** Not given in 1942–43.]

[**Orthogonal Functions.** Not given in 1942–43.]

[**Potential Functions.** Not given in 1942–43.]

[**Mechanics.** Not given in 1942–43.]

[**Hydrodynamics and Elasticity.** Not given in 1942–43.]

METEOROLOGY

Professor R. A. MORDOFF.

Approved Major and Minor Subjects (key to symbols on p. 41)

Meteorology 1, 2, 4

A broad field for investigation and research is offered in meteorology. The weather and climatic factors, in their relation to crop distribution and production and to engineering, transportation, economic and social problems, are suitable subjects for graduate study.

A graduate student in meteorology should have completed the elementary courses in meteorology and climatology, physics, mathematics, geology, and preferably elementary statistics.

1. *Elementary Meteorology.* Either term. Three hours a week.

2. **Climatology.** First term. Prerequisite, Meteorology 1 or the equivalent. Professor MORDOFF. M W 9. Plant Science 114.

A course covering general climatology and the various climates of the United States with emphasis on those of New York State.

221. **Research.** First or second term. Prerequisite, Climatology 2 or the equivalent. Professor MORDOFF. Hours by appointment.

Original investigations in meteorology and climatology.

212. **Seminar.** First term. Prerequisite, Climatology 2 or the equivalent. Professor MORDOFF. Hours to be arranged. Plant Science 114.

Preparation and reading of reports on special topics. Abstracts and discussions of papers dealing with the current literature of meteorology and climatology.

PHYSICS

Professors R. C. GIBBS, R. F. BACHER, L. L. BARNES, H. A. BETHE, J. R. COLEINS, G. E. GRANTHAM, H. E. HOWE, E. H. KENNARD, C. C. MURDOCK, L. G. PARRATT, B. ROSSI, L. P. SMITH, and D. H. TOMBOULIAN; *Doctors* C. W. GARTLEIN, M. G. HOLLOWAY, H. HURWITZ, JR., H. F. NEWHALL, G. PLACZEK, and G. F. TAPE.

Approved Major and Minor Subjects (key to symbols on p. 41)

Physics 1, 2, 3, 4
Experimental Physics 1, 2, 3, 4
Theoretical Physics 1, 2, 3, 4
Applied Physics 1, 2, 3, 4
Mathematical Physics 3
Biophysics 3, 4

NOTES.—The major and both minor subjects for the Ph.D. should not be chosen inside the field of physics.

The major subject for the Ph.D. may be called Experimental Physics only if accompanied by Theoretical or Mathematical Physics as a minor, and Theoretical Physics only if accompanied by Experimental Physics as a minor.

Applied Physics as a major for the Ph.D. must be accompanied by a minor subject in the field of physics.

Members of the staff are especially interested in directing graduate research in the following fields:

Experimental Physics. Nuclear physics; cosmic rays; atomic spectra, including nuclear effects; absorption spectra; x-rays; x-ray and electron diffraction; electronics, electrical phenomena in gases, and photoelectricity.

Theoretical Physics. Quantum mechanics, particularly the theory of radiation, of nuclei, and of solids; electric waves; hydro- and aerodynamics.

Members of the staff who are in residence in Ithaca during the summer often stand ready to consult with investigators.

Important Notice. Since only a limited number of graduate students can be accommodated in physics, students should make arrangements for admission by application to the Dean of the Graduate School before coming to Ithaca.

A colloquium in general physics and a seminar in theoretical physics meet regularly, and seminars in special fields as arranged.

U 3, 4. *Introductory Physics.* Three hours a week.

U 6, 11, 12. *Introductory Physics.* Four hours a week.

U 21, 22. *General Physics.* Three hours a week.

U 41, 42. *Special Topics in Modern Physics.* Two hours a week.

U 55. *Introductory Physical Experiments.* Either term. Three hours a week. For pre-medical students, and biology majors.

U 60. *Physical Experiments.* Both terms. Three hours a week. Laboratory to accompany Physics 61–62.

U 61, 62. *General Physics.* Throughout the year. Three hours a week. Prerequisite, Physics 3, 4, or the equivalent.

U 105. *Advanced Laboratory Practice.* Either term. Two laboratory periods and a seminar each week.

111. **Analytical Mechanics.** First term. Credit three hours. Prerequisites, Physics 60, 61, and 62 and (or in parallel) Mathematics 65c, or their equivalents. Associate Professor ROSSI. T Th S 11.

Introductory analytical mechanics; material particles, systems of particles, and rigid bodies; oscillations.

[112. **Properties of Matter.** Second term. Credit three hours. Prerequisite, Physics 111 or its equivalent. Professor MURDOCK. Given in alternate years, not in 1942–43.]

Gravitation, crystalline state, mechanics of deformable solids and fluids, surface phenomena, and diffusion.

121. **Electricity and Magnetism.** First term. Credit three hours. Prerequisites, Physics 60, 61, and 62 and (or in parallel) Mathematics 65c, or their equivalents. Professor MURDOCK. T Th S 10.

Electrostatic, magnetostatic, and electromagnetic fields.

122. **Electricity and Magnetism.** Second term. Credit three hours. Prerequisite, Physics 121. Professor MURDOCK. T Th S 10.

Metallic, electrolytic, and gaseous conduction; thermal and chemical electromotive forces; variable current phenomena; electromagnetic waves.

[132. **Light.** Second term. Credit three hours. Prerequisites, Physics 60 and 61, and Mathematics 65b, or their equivalents. Professor HOWE. T Th S 8. Given in alternate years, not in 1942–43.]

A study of lens systems, diffraction, interference, double refraction, and polarization.

142. **Heat.** Second term. Credit three hours. Prerequisites, Physics 60 and 62, and (or in parallel) Mathematics 65c, or their equivalents. Associate Professor ROSSI. T Th S 9. Given in alternate years.

Temperature scales, specific heats, thermal conductivity, thermodynamics, thermal radiation, high-temperature measurements, and kinetic theory.

162. **Wave Motion and Sound.** Second term. Credit three hours. Prerequisite, Physics 111 or the equivalent. Professor COLLINS. M W F 8. Given in alternate years.

Properties of deformable media, the general properties of wave motion; a comparative study of elastic waves, waves on the surface of liquids, and sound waves; a detailed study of sound phenomena.

171. **Modern Topics in Physics.** First term. Credit three hours. Prerequisites, Physics 60, 61, and 62, and (or in parallel) Mathematics 65c, or their equivalents. ———— and other members of the staff. M W F 12. Will be given only on sufficient demand.

Relativity, wave mechanics, optical spectra, x-rays and nuclear physics. In each of these fields a particularly qualified member of the staff gives part of the work.

200. **Introduction to Theoretical Physics.** Throughout the year. Prerequisites, Physics 111, and (or in parallel) Physics 121, or their equivalents in informal study. Part A: first term, Professor BETHE or Professor KENNARD; second term, Professor KENNARD or Associate Professor ROSSI. T Th S 11. Part B. Dr. PLACZEK.

Part A, three hours of lectures and problem work on certain fundamental and generally useful phases, such as analytical mechanics, hydrodynamics, kinetic theory, electrodynamics, optics, and relativity; Part B, additional individual study of some of these topics and of thermodynamics and electrostatics, equivalent to a two-hour course. In general the two parts should not be separated.

[223. **Theory of Electric Waves.** First term. Credit three hours. Prerequisite, Physics 200 or its equivalent. Professor BETHE. M W F 9. Given in alternate years, not in 1942–43.]

Theory of the generation, emission, propagation, and detection of electric waves, on the basis of Maxwell's equations. Oscillating circuits. Propagation along wires. Wave guides and cavities and their excitation. Wave patterns, production of directed beams. Propagation along the earth's surface; reflection by the Heaviside layer, scattering. Detectors.

233. **Theoretical Optics.** First term. Credit three hours. Prerequisite, Physics 200 or the equivalent. Professor COLLINS. M W F 8. Given in alternate years.

Electromagnetic theory, dispersion, absorption, optical properties of metals, diffraction, propagation in crystals.

[254. **Kinetic Theory and Statistical Mechanics.** Second term. Credit two hours. Prerequisite, relevant parts of Physics 200. Professor KENNARD. W F 8. Given in alternate years, not in 1942–43.]

Molecular theory of the principal phenomena in gases; the principles and certain applications of statistical mechanics.

271. **Introductory Quantum Mechanics.** First term. Credit three hours. Prerequisite, Physics 200 or the equivalent. Professor BETHE. M W F 9.

The Schrodinger equation. Uncertainty principle. Oscillator, rotator, hydrogen atom. Perturbation theory. Spin and relativity effects.

272. **Quantum Mechanics.** Second term. Credit three hours. Prerequisite, Physics 271. Professor BETHE. M W F 9.

Theory of atomic spectra, periodic system of the elements, multiplet structure. Quantum theory of collisions; elastic scattering, excitation and ionization, energy loss of charged particles. Brief discussion of molecular structure and of the quantum theory of solids.

300. **Advanced Laboratory.** First and second terms. Credit three hours a term. Prerequisite, Physics 105 or the equivalent. Professor COLLINS and Mr. TRISCHKA. Two laboratory periods a week with outside work in reading and computation. Laboratory open T W Th F afternoons. Rockefeller 301. Laboratory fee each term, $10.

A course of experiments designed to broaden the student's acquaintance with

the methods of physical measurements and their interpretation and to afford training in the use of modern physical equipment.

315. **Special Topics in Physics.** Reading or laboratory work in any branch of physics under the direction of some member of the staff.

320. **Special Topics Laboratory.** Prerequisites, Physics 105, or the equivalent, and consent of the instructor. Two laboratory periods a week and discussion periods as arranged. Laboratory fee, each field, $10.

Systematic laboratory work together with appropriate lectures and discussions will be offered in the following fields:

[(a) Nuclear Physics. First term. Credit two hours. Dr. TAPE. Given in alternate years, not in 1942–43.] Operation and use of the cloud chamber, Geiger counter, and ionization chamber. The production of artificial radioactivity using the cyclotron, alpha-particle range measurement, half life determination, beta and gamma ray absorption.

[(b) Spectroscopy. Second term. Credit two hours. ————. Given in alternate years, not in 1942–43.] Experiments, to suit the student's needs, such as emission and absorption spectra from various sources, Zeeman effect, nuclear effects, molecular spectra, spectrophotometry, Raman effect, and spectrochemical analysis.

(c) X-rays. First or second term. Credit two or three hours. Associate Professor PARRATT. Given in alternate years. Operation of x-ray tubes, photographic and ionization-intensity measurements, absorption, Compton effect, emission and absorption spectra, polarization, refraction and dosage measurements.

(d) Electronics and Ionics. First term. Credit two or three hours. Dr. NEWHALL. Given in alternate years. Vacuum technique and low pressure measurements, ionization, and resonance potentials, e and e/m for electrons, mass spectroscopy, work functions, secondary emission, photoelectric effects, and construction of special tubes.

(e) Crystal Structure by X-ray and Electron Diffraction. First or second term. Credit two hours. Professor MURDOCK. Given in alternate years. A study of the experimental techniques and methods of computation involved in the determination of structure by diffraction.

(f) High Temperature Measurements. Second term. Credit two hours. Professor COLLINS. Given in alternate years. Application of radiation methods to the measurements of temperature.

[405. **Mathematical Methods in Physics.** Throughout the year. Credit three hours a term. Prerequisites, Mathematics 65c, or the equivalent, and at least two years of general physics. Professor SMITH. Given in alternate years, not in 1942–43.]

Lectures and problem work designed to give the student a working knowledge of the principal mathematical methods used in advanced physics.

[452. **Hydrodynamics and Aerodynamics.** Second term. Credit three hours. Prerequisite, Physics 111 or its equivalent and a working knowledge of differential equations. Open to graduate students in physics, engineering, and mathematics. Professor BETHE. M W F 12. Given in alternate years, not in 1942–43.]

Fundamental equations of hydrodynamics. Brief discussion of potential flow. Stokes' law. Prandtl's theory of the boundary layer. Dead water and Karman's vortex trails. Lift and resistance of airfoils. Phenomena due to the compressibility of air. Shock waves.

476. **Theory of Solids.** Second term. Credit three hours. Prerequisite, Physics 271. Professor BETHE. T Th S 10.

Crystal symmetry and crystal vibrations. Quantum theory of electrons in solids; the band concept. Calculation of electron energies, of the heat of sublimation and of the work function. Theory of conductivity and of the optical and magnetic properties of metals. Theory of semiconductors. Thermionic and field emission, photoelectric effect, secondary electron emission, fluorescence, and phosphorescence.

571. **Atomic Spectroscopy.** First term. Credit three hours. Open to qualified students by permission. Professor GIBBS. Given in alternate years. M W F 12.

Discussion of observational data and their relation to the theory of atomic structure, hyperfine structure and nuclear moments, Zeeman effect, breadth of spectral lines, intensity, applications to other fields.

572. **Molecular Spectroscopy.** Second term. Credit three hours. Prerequisite, Physics 571 or special permission. Associate Professor SHAW. Given in alternate years. M W F 12.

Discussion of molecular structure as revealed by infra-red, visible, ultra-violet, and Raman spectra. Correlation of results with x-ray and electron diffraction methods. Application of techniques to astronomy, biology, chemistry, and industry.

[597. **X-ray and Electron Diffraction.** First term. Credit three hours. Prerequisites, Physics 121, 122, and 132 or their equivalents. Professor MURDOCK. Given in alternate years, not in 1942–43.]

Space group and reciprocal lattice theory, diffraction by three dimensional gratings, extinction, interpretation of x-ray and electron diffraction data, structure determination by Fourier synthesis, resolving power and diffraction by fluids.

[598. **X-rays.** Second term. Credit three hours. Open to qualified students by permission. Associate Professor PARRATT. Given in alternate years, not in 1942–43.]

X-ray production and measurement, scattering, absorption, diffraction, and spectra; the relation of these processes to modern concepts of atomic and solid structure.

641. **Advanced Electronics and Ultra-High-Frequencies.** First term. Credit three hours. Prerequisites, Mathematics 200 and Physics 122 or 41 and (or in parallel) 320d or their equivalents. Professor SMITH. As arranged.

Lectures covering such topics as motion of ions and electrons in metals, semiconductors and dielectrics; thermionics, secondary and field emission; excitation and ionization cross-sections; electrical phenomena in gases; generation and behavior of ultra-high-frequency electromagnetic fields including cavities and wave guides.

642. **Advanced Electronics and Ultra-High-Frequencies.** Second term. Credit three hours. Prerequisite, Physics 641 and 320d. Professor SMITH and ————. Laboratory fee, $15. Given in alternate years.

Advanced laboratory work partly of a semi-research type designed to furnish experience and modern techniques in fields such as those mentioned under Physics 641.

711. **Nuclear Physics.** First term. Credit three hours. Prerequisite, Physics 271. Dr. HOLLOWAY, Professor BETHE, and Dr. PLACZEK. M W F 11. Given in alternate years. A combined experimental and theoretical course.

Discussion of the methods of detection and general properties of protons, alpha particles, neutrons, beta particles, and gamma rays. Theory of nuclear forces and of the structure of simple nuclei. Experimental results and theory of nuclear disintegrations, radioactivity, scattering of nuclear particles, and nuclear resonance effects.

[751. **Cosmic Rays.** First term. Credit two hours. Prerequisite, a course in quantum theory or registration in Physics 271. Associate Professor ROSSI. M W 10. Given in alternate years, not in 1942–43.]

Properties of the high energy particles which form the cosmic radiation; experimental results and theoretical interpretation. Secondary effects of cosmic rays in matter; cascade theory of showers. Variation of cosmic rays with altitude and latitude; influence of the earth's magnetic field; decay of mesotrons; nature and energy distribution of the primary cosmic rays.

EXPLANATORY STATEMENTS

472. **Quantum Theory of Spectra.**

477. **Quantum Theory of Collisions.**

481. **Advanced Quantum Mechanics.**

The three above courses will not be given during the present emergency. Students are referred to course 272 instead. Students desiring a more intensive knowledge may acquire it by informal reading with registration in course 315. Dr. PLACZEK and Professor BETHE will be glad to direct such reading.

478. **Quantum Theory of Nuclei.** During the present emergency, this course will be incorporated in course 711.

AGRICULTURE, INCLUDING FORESTRY

AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

(Business Management, Farm Management, Land Economics and Farm Finance, Marketing, Prices and Statistics, Public Administration and Finance.)

Professors G. P. Scoville, E. G. Misner, W. I. Myers, F. A. Pearson, Leland Spencer, V. B. Hart, M. P. Rasmussen, F. F. Hill, M. S. Kendrick, M. C. Bond, Whiton Powell, M. P. Catherwood, S. W. Warren, F. A. Harper, L. C. Cunningham, P. S. Williamson, W. M. Curtiss, T. N. Hurd, and H. F. DeGraff; *Doctor* A. Van Wagenen.

Approved Major and Minor Subjects (key to symbols on p. 41)

Business Management 1, 2, 3, 4
Farm Management 1, 2, 3, 4
Land Economics and Farm Finance 1, 2, 3, 4
Marketing 1, 2, 3, 4
Prices and Statistics 1, 2, 3, 4
Public Administration and Finance 1, 2, 3, 4
Agricultural Economics 4

Business Management

Attention is directed to Administrative Engineering 3A23 (Business and Industrial Management), Geology 206 (Commercial Geography), and to the courses in Economics.

120. *Personal Financial Management.* First term. Two lectures and one discussion a week.

121. **Financial Statements.** First term. Credit three hours. Professor Powell. Lectures, T Th 9. Warren 225. Discussion and quiz, W 11–1. Warren 201. Fee for materials furnished, $2.

For persons who wish to understand and interpret the statements of financial condition and income of cooperatives and other businesses. Content of and relationship between balance sheet, operating statement, and statement of surplus; methods of valuing assets; analysis by means of ratios.

122. **Accounting Method.** Second term. Credit three hours. Class will meet during Farm and Home Week for those who have not had Course 121. Professor Powell. Lectures, W F 11. Warren 225. Practice period, F 1:40–4. Warren 201. Fee for materials furnished, $1.

For persons who wish to understand the records and procedures commonly used in keeping accounts of cooperatives and other businesses. Recording business transactions and deriving financial statements; analyses of costs and budgets.

126. **Farmers' Cooperatives.** Second term. Credit three hours. Professor Powell. Lectures, W F 8. Warren 225. Discussion, S 9–10:20. Warren 201. Fee for materials furnished, $2.

What cooperatives have tried to do and what they have done; their special problems of organization, finance, and control.

127. **Business Law.** First term. Credit three hours. Mr. Allan H. Treman. Lectures, M W F 8. Caldwell 100.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage in business, including contracts, liens, mortgages, and negotiable instruments; ownership and leasing of property; wills; estates; inheritance taxation; and other practical problems.

Farm Management

2. *Agricultural Geography.* First term. Two lectures and one discussion period a week.

102. **Farm Management.** Second term. Credit five hours. Associate Professor Warren and other members of the departmental staff. Lectures, M W F 10. Warren 25. Laboratory, F 4–6. Warren 101. On days when farms are visited, laboratory period will be 1:40–6. Fee for materials furnished and for transportation on trips, $6.

Farming as a business; types of farming; size of business; rates of production; labor efficiency; combination of enterprises; farm layout; building arrangement; machinery; forms of tenure and leases; choosing and buying a farm; use of capital and credit; planning the organization and management of specific farms. One all-day trip and four half-day trips are taken during April and May to visit farms in near-by regions. These trips are taken on the day of the regular laboratory period.

103. *Farm Records and Accounts.* First term. Two lectures and one laboratory period a week.

203. **Business Organization and Management of Successful New York Farms.** First term. Credit four hours. Prerequisite, course 102 or its equivalent. Professor Scoville. F 1:40–4, S 8–10. Warren 101. Approximate transportation expenses for trips, $20. Fee for materials furnished, $2.

During October and November all-day trips are usually taken on Saturdays. Two two-day trips are taken, leaving Friday morning and returning Saturday night.

207. **Methods and Results of Research in Farm Management and Land Economics.** Throughout the year. Credit one hour each term. Professors Hill and Warren and other members of the departmental staff. Th 7:30–9:30 p.m. every two weeks, Warren 140.

A discussion of research problems in farm management and land economics. Opportunity will be given to study special problems suggested by members of the group.

209. **Comparative Agriculture.** First term. Credit two hours. Professor Misner. T Th 11. Warren 125. Fee for materials furnished, $1.

A study of the agriculture of various foreign countries with emphasis on the farm-management aspects.

Land Economics and Farm Finance

181. **Land Economics.** Second term. Credit three hours. Professor Hill. Lectures, T Th 8. Warren 125. Laboratory, T 1:40–4. Warren 140. Fee for materials furnished, $2.

A number of field trips will be taken during April and May. The expenses of such trips will not exceed $3.50.

The characteristics of land and their relation to population and public policies; the theory, methods, results, and use of land classification studies.

184. **Farm Finance.** First term. Credit three hours. Professor Myers. Lecture, Th 10. Lecture and discussion, Th 1:40–4. Warren 125. Fee for materials furnished, $1.

A study of the credit institutions which serve agriculture.

187. **Farm Appraisal.** First term. Credit two hours. Associate Professor Warren. Lecture, T 10. Laboratory, T 1:40–5 (1:40–4 during the latter part of the term when no trips are taken). Warren 201. Fee for materials furnished, $1.

A study of factors governing the price of land; methods of land valuation; the appraisal of farms for use, for sale, for purposes of making loans, and for taxation.

Marketing

141. **Marketing.** First term. Credit three hours. Professor Harper. Lectures, W F 10. Warren 225. Laboratory and discussion, Th 11–1. Warren 240. Fee for materials furnished, $2.

A general course dealing with problems of distribution of farm products. Characteristics of consumer-demand; factors to be considered in judging the best marketing plan from the standpoints of when, where, in what form, and through what channels to sell; public regulation and controls.

142. **Marketing Fruits and Vegetables.** First term. Credit four hours. Professor RASMUSSEN. Lectures, M W F 9. Warren 25. Laboratory, Th or F 1:40–4. Warren 240. Fee for materials furnished, $3.

A study of the economic factors involved in the marketing of fruits and vegetables. Regional and seasonal competition; areas of distribution; methods of handling; costs of marketing; types of marketing organizations; sales methods; transportation and carrier services; produce law and methods of credit rating; terminal problems.

143. **Marketing Dairy Products.** Second term. Credit three hours. Professor SPENCER. Lectures, M W 9. Warren 225. Discussion period, F 8–10 or F 1:40–3:40. Warren 240. One all-day trip to visit milk plants is taken some time in May. A list of lectures to be attended during Farm and Home Week will be posted. Fee for materials furnished and for transportation on trips, $4.

A study of the marketing of fluid milk, and other dairy products; economic geography of the industry; demand; supply; surplus; price plans and policies; costs of distribution; cooperative marketing; trade organizations; public regulation.

[146. **Milk Distribution and Public Regulation of the Milk Industry.** Second term. Credit one hour. (Students who have taken or are taking course 143 or equivalent may register for two hours credit.) Professor SPENCER in charge. Not given in 1942–43.]

Lectures and discussions principally by visiting lecturers, including persons connected with milk producers associations, milk distribution enterprises, and milk control agencies.

144. **Marketing Poultry Products.** Second term. Credit three hours. Dr. VAN WAGENEN. Lectures, T Th 10. Warren 225. Laboratory, T 1:40–4. Graduate section at hour to be arranged. Warren 240. Fee for materials furnished, $2.

A study of the economic factors involved in the marketing of eggs and poultry, including: areas of production; distribution channels; sales methods; market costs; cold-storage operations; legislation; demand; terminal-market and consumption problems.

147. **Marketing Trip to New York City.** Second term. Credit one hour. Given only if twenty or more students register. Enrollment limited to 40. Dr. VAN WAGENEN in charge. Representatives of other departments will cooperate in the course.

Five days of the spring vacation will be spent in New York City inspecting and studying the marketing of dairy products, eggs, poultry, fruits, vegetables, livestock, and meat. A short series of introductory lectures will precede the trip—at hours to be arranged.

Fee for materials furnished, $2. A $4 deposit for bus hire and incidental expenses will be payable 10 days before the trip, at Warren 205. Total cost of trip need not exceed $28, in addition to transportation to and from New York City.

240. **Research in Marketing.** Throughout the year. Credit 2 hours a term. W 4–6. Warren 240.

Designed to be taken continuously by graduate students interested in marketing. Members of the staff will have charge in rotation.

Among the subjects to be considered are: the scope of marketing research; analysis of marketing problems; planning of projects; collecting and analyzing data; presentation of results; critical reviews of marketing research at various institutions.

PRICES AND STATISTICS

Attention is directed to Mathematics 30 (Mathematics for Students of economics and statistics), and to Mathematics 400 (Statistics).

111. **Statistics.** First term. Credit three hours. Professor ————. Lecture, M 8. Warren 125. Laboratory, M 1:40–4. Warren 25. Fee for materials furnished, $3.

A study of the principles involved in the collection, tabulation, and interpretation of agricultural and marketing statistics. Analysis of statistical problems with an 80-column tabulating machine.

112. **Statistics.** Second term. Credit three hours. Prerequisite, course 111. Professor ————. Lecture, M 8. Laboratory, M 1:40–4. Warren 125. Fee for materials furnished, $3.

A continuation of course 111. A study of the application of probable error; sampling; gross, partial, and multiple correlation; curve fitting to problems in this field. Methods of using 80-column tabulating equipment for multiple-correlation analysis.

115. **Prices.** Second term. Credit three hours. Professor PEARSON. Lectures, T Th 9. Laboratory, W 1:40–4. Warren 25. Fee for materials furnished, $3.

A study of prices of farm products in relation to agricultural and industrial conditions.

215. **Prices.** First term. Credit one hour. Prerequisite, course 115. Open to graduate students only. W 2–4. Warren B-17. Professor PEARSON.

PUBLIC ADMINISTRATION AND FINANCE

135. **Local Government.** First term. Credit three hours. Professor ————. Lectures, W F 8. Warren 125. Laboratory, Th or F 1:40–4. Warren 140. Fee for materials furnished, $2.

Historical development, organization, and operation of local government. Particular attention is given to receipts, expenditures, and administration of counties, towns, and school districts in New York.

138. **Taxation.** Second term. Credit three hours. Professor KENDRICK. Lectures, M W F 11. Warren 25. Fee for materials furnished, $2.

A study of the principles and practices of public finance with emphasis on taxation. Among the topics examined are: the growth of public expenditures; the changing pattern of federal, state, and local taxation; general-property, inheritance, business, and personal income taxation; the incidence of taxation; and the problem of war finance.

235. **Problems in Financial Administration.** First term. Credit three hours. Professor ————. Alternates with course 236. Time and room to be arranged. Fee for materials furnished, $2.

Attention is given to a number of problems in governmental financial administration with special reference to New York, including accounting systems, budgetary procedure, borrowing procedure, and debt and tax limits.

[236. **Problems in Public Administration.** First term. Credit three hours. Professor CATHERWOOD. Alternates with course 235. Not given in 1942–43.]

Attention is given to a number of problems in public administration with special reference to New York including state and local planning, personnel administration, and administrative organization.

238. **Seminar in Public Finance.** Second term. Credit two hours. Professor KENDRICK. W 2–4. Room to be arranged.

An examination of basic problems in public finance.

RURAL ECONOMY

[151. **Public Problems of Agriculture.** Second term. Credit two hours. Professor ————. Not given in 1942–43.]

A discussion of some of the more important problems of agriculture that involve collective or governmental action.

152. *Current Problems of Agriculture.* Second term. One lecture a week.

DEPARTMENTAL SEMINAR

299. **Seminar.** First and second terms. Departmental Staff. M 4. Warren 401.

AGRICULTURAL ENGINEERING

Professors H. W. RILEY, B. B. ROBB, A. M. GOODMAN, J. C. MCCURDY, B. A. JENNINGS, L. M. ROEHL, and F. B. WRIGHT.

Approved Major and Minor Subjects (key to symbols on p. 41)

Farm Structures 1, 2, 3, 4
Farm Equipment 1, 2, 3, 4
Agricultural Engineering 1, 2, 3, 4
Engineering of Soil Management 1, 2, 3, 4

The laboratories of the Department are well equipped for the usual types of investigations in the fields listed. Special equipment can generally be supplied when needed.

Students desiring to undertake work in Agricultural Engineering should have, first of all, adequate grounding in the fundamentals of the phase studied and ability to perceive the applications of these fundamentals, since the applications of engineering practices to agriculture, though of great economic importance, are usually successful in proportion as they are direct and simple. First hand knowledge of farm life and of rural conditions generally are most essential for some problems. Whether a student's preparation is adequate for any given line of advanced study can be determined only by special consideration of each case.

1. *Farm Mechanics.* Either term. Three hours a week.

101. *Electricity on the Farm.* Either term. Three hours a week.

102. *Farm Power.* First term. Three hours a week.

103. *Field Machinery.* Second term. Three hours a week.

10. *Household Mechanics.* Either term. Three hours a week. For women students.

21. *Farm Engineering.* Either term. Three hours a week.

[121. *Farm Engineering, Advanced Course.* Second term. Two hours a week. Given in alternate years, not in 1942–43.]

122. *Drainage and Irrigation.* Second term. Two hours a week. Given in alternate years.

24. *Farm Concrete.* First term. Two hours a week.

31. *Farm Structures.* First term. Three hours a week.

40. *Farm Shop Work.* Either term. Two hours a week.

41. *Shop Work for Rural High School Teachers.* Either term. Three hours a week.

47. *Farm Blacksmithing.* Either term. One hour a week.

251. **Research in Agricultural Engineering.** Prerequisite, permission to register. Professors RILEY, ROBB, GOODMAN, MCCURDY, JENNINGS, and ROEHL and Assistant Professor F. B. WRIGHT. Hours as arranged. Investigations for which the student is prepared and for which adequate facilities can be provided.

252. **Seminary.** Required of graduate students. Both terms, credit one hour a term. Professor ROBB. T 4:30–5:45. Presentation and discussion of papers on special problems in agricultural engineering.

AGRONOMY

Professors R. BRADFIELD, J. A. BIZZELL, H. O. BUCKMAN, J. K. WILSON, A. F. GUSTAFSON, F. B. HOWE, H. B. HARTWIG, E. V. STAKER, D. B. JOHNSTONE-WALLACE, R. F. CHANDLER, JR., R. B. MUSGRAVE, and MICHAEL PEECH; at Geneva, *Professor* H. J. CONN.

Approved Major and Minor Subjects (key to symbols on p. 41)

Soils 1, 2, 4
Field Crop Production 1, 2, 4

The laboratories of the Department are well equipped for chemical, physical, and microbiological investigations of soils and field crops. Greenhouses are available for soil and crop experimentation during the winter and a field, conveniently

located and well equipped, is available for experiments on a larger scale during the summer. Special equipment can generally be supplied when needed. The Departmental library contains the more important journals, reference works, and experiment station literature.

Members of the staff will be especially interested in directing research in the fields as listed: Professor BIZZELL, in soil fertility; Professor PEECH in Soil Chemistry; Professor BRADFIELD in soil physics and physical chemistry; Professor BUCKMAN in soil genesis and geography; Professor HOWE in the morphology, classification, and cartography of soils; Professor J. K. WILSON and Professor H. J. CONN in soil microbiology; Professor STAKER in organic soils; Professor CHANDLER in forest soils; Professor GUSTAFSON in soil conservation; Professor HARTWIG in field crop production; Professor JOHNSTONE-WALLACE in pasture management; and Professor MUSGRAVE in field crop ecology. Prospective students are urged to correspond with the member of the staff whose interests are most closely related to their own a few months in advance of the time they expect to enter upon their work, as only a limited number of students can be accommodated.

Students preparing for graduate work in Agronomy are urged to obtain a thorough knowledge of general physics, analytical, organic, and physical chemistry, general botany, bacteriology, plant physiology, and geology. Opportunity will be afforded for further study of some of these subjects after entering the Graduate School, but a student deficient in two or more of these foundation courses cannot expect to receive a degree in the minimum time required for residence. Some practical experience with soil and crop management problems is also desirable. Opportunity to acquire additional experience will be afforded a limited number of students majoring in the Department by summer employment on Departmental projects.

Students must consult professor in charge before registering for any course numbered above 100.

SOIL SCIENCE

1. *The Nature and Properties of Soils.* First or second term. Credit five hours.

101. **Origin, Morphology, Classification, and Mapping of Soils.** Second term. Credit three hours. Prerequisite, course 1. Lectures, T Th 10. Caldwell 100. Professor HOWE.

A course dealing with the origin, profile characteristics, classification, and mapping of soils. An important part of the course will be devoted to field examination of soils, cartographic expression, and interpretation of soil maps. Field trips to be arranged. Cost of field trips will be included in laboratory fee. Laboratory fee, $5.

102. **Soil Conservation.** Second term. Credit two hours. Prerequisites, courses 1 and 11 or their equivalents. Professor GUSTAFSON. Lectures, T Th 11. Caldwell 143. Laboratory fee, $4.

An analysis of the causes of the decline in the inherent productivity of soils and of practical methods of management which will permanently maintain their productivity. The causes of erosion and its control by agronomic methods will receive special emphasis. Two all-day Saturday field trips.

[103. **Organic Soils.** First term. Credit two hours. Prerequisites, course 1 and Chemistry 201. Assistant Professor STAKER. Lectures, W F 8. Caldwell 143. Given in alternate years, not in 1942–43.]

A course designed primarily for students specializing in soil technology. Emphasis is placed on the composition and properties of organic soils.

104. **Forest Soils.** First term. Credit two hours. Prerequisites, course 1 and Botany 31. Associate Professor CHANDLER. Lectures, W F 8. Caldwell 143. Given in alternate years.

Assigned readings and semi-weekly discussions of the more important forest soils literature. There will be occasional field trips.

106. **Soil Microbiology.** Second term. Credit three hours. Prerequisites, course 1, excepting students majoring in bacteriology, Bacteriology 1, and Chemistry 201 or its equivalent. Professor J. K. WILSON. Lectures, M W 8. Caldwell 143. Laboratory, W or F 1:40–4. Caldwell 201. Laboratory fee, $5.

A course in biological soil processes designed primarily for students specializing in soil technology and bacteriology. The laboratory work is supplemented by reports and by abstracts of important papers on the subject.

205. **Soil Fertility, Advanced Course.** First term. Credit three hours. Prerequisites, course 1 and Chemistry 201, or its equivalent. Professor BIZZELL. Lectures, T Th S 8. Caldwell 143.

The lectures are supplemented by reviews of literature and by the preparation of abstracts.

207. **Physical and Chemical Properties of Soils. Lectures.** Second term. Credit three hours. Prerequisites, course 1, Physics 3 and 4, Chemistry 201. A course in physical chemistry is recommended. Professor BRADFIELD. Lectures, T Th S 8. Caldwell 143.

A study of physical and chemical processes and changes which take place in soils with emphasis upon their practical application and significance.

208. **Physical and Chemical Properties of Soils. Laboratory.** Second term. Credit three hours. Must be preceded or accompanied by Agronomy 207. Enrollment limited. Professor BRADFIELD and Assistant Professor PEECH. Laboratory, M W 1:40–4. Caldwell 294. Laboratory fee, $5.

Laboratory practice in the use of physical and physico-chemical techniques used in soil investigations.

209. **Research in Soil Science.** Throughout the year. Professors BIZZELL, BRADFIELD, BUCKMAN, CONN, GUSTAFSON, J. K. WILSON, and HOWE, Associate Professor CHANDLER, and Assistant Professors STAKER and PEECH.

210. **Special Topics in Soil Science.** Throughout the year. Credit one to three hours. Prerequisites, ten credit hours in Soil Science. Day and hour to be arranged.

Topics for 1942–43: To be announced later.

FIELD CROPS

11. *Production of Field Crops.* First or second term. Credit four hours.

[211. **Field Crops, Advanced Course.** Second term. Credit two hours. Prerequisites, Agronomy 11, Botany 31, and Plant Breeding 211, or their equivalent. Professor H. B. HARTWIG. Lectures and discussions, T Th 10. Caldwell 250. Given in alternate years, not in 1942–43.]

A literature course organized to meet the needs of students specializing in field crops. Current problems involving crops other than pasture will be considered. The emphasis will be on forage crops. In addition to lectures, papers will be assigned for reading and abstracting.

212. **Pastures.** Second term. Credit three hours. Prerequisites, courses 1 and 11, or their equivalent. Assistant Professor JOHNSTONE-WALLACE. Lectures and discussions, T Th 9. Caldwell 143. Laboratory and field trips, Th 1:40–4. Laboratory fee, $4.

Special attention will be devoted to the principles involved in the improvement and management of pastures in humid, temperate climates. Current literature will be studied.

213. **Crop Ecology.** First term. Credit three hours. Prerequisites, course 11 and Botany 31, or their equivalent. Assistant Professor MUSGRAVE. Given in alternate years.

An analysis of the environment of crop plants and their ecological responses, with emphasis on the cereals and on the legumes and grasses used for forage.

219. **Research in Field Crop Production.** Throughout the year. Professor HARTWIG, Assistant Professors JOHNSTONE-WALLACE and MUSGRAVE.

AGRONOMY

290. **Seminar.** Throughout the year. Required of graduate students taking work in the Department. Professor BRADFIELD and departmental staff. S 11–12:30. Caldwell 143.

ANIMAL BREEDING

See under ANIMAL SCIENCES, p. 78.

ANIMAL HUSBANDRY

Professors F. B. MORRISON, S. A. ASDELL, L. L. BARNES, G. H. ELLIS, E. S. HARRISON, R. B. HINMAN, J. K. LOOSLI, L. A. MAYNARD, J. I. MILLER, G. W. SALISBURY, E. S. SAVAGE, and J. P. WILLMAN.

Approved Major and Minor Subjects (key to symbols on p. 41)

Animal Husbandry 1, 2, 3, 4
Animal Nutrition 1, 2, 3, 4 (See also under Animal Nutrition)
Animal Breeding 1, 2, 3, 4 (See also under Animal Breeding)

Note. If the major for the Ph.D. degree lies in one of these three fields, not more than one of the other two should be selected for a minor.

For the special facilities of the Animal Husbandry department in Animal Breeding and Animal Nutrition and detailed descriptions of the courses in these fields see the statements under these subjects.

The department is well equipped with herds and flocks of animals of the leading breeds of livestock and with modern barns adapted for experimental work. The livestock includes a herd of over 300 dairy cattle, a herd of beef cattle, studs of draft horses, a flock of over 200 sheep, and a herd of breeding swine. The library includes a very full collection of the herd and flock registers of all of the breeds of domestic animals kept in this country, amounting to more than one thousand volumes, and affording excellent facilities in heredity and genetics.

The animals of the herds and flocks and their records provide opportunity for studying problems of nutrition, livestock feeding, breeding, and production.

Slaughter and meat laboratories are available for the study of the relation of breeding and nutrition to anatomical structure and to chemical composition and food value. The college animals are available for studies relating to the production and the processing, sale, grading, and measuring of their various products such as milk, meat, and horse power, including animal mechanics.

In order to enter upon graduate study in animal production, the student should have the equivalent of the following courses: elementary feeds and feeding, elementary breeding, and the elementary production courses in dairy and beef cattle, horses, sheep, and swine.

1. *Livestock Production.* First term. Two lectures and one laboratory period a week.

10. *Livestock Feeding.* First or second term. Three lectures and one laboratory period a week.

20. *Animal Breeding.* First term. Two lectures and one laboratory period a week.

40. *The Horse.* Second term. Two lectures and one laboratory period a week.

41. *Livestock Judging: Beef Cattle, Horses, Sheep, and Swine.* First term. One lecture and laboratory period a week.

42. *Advanced Livestock Judging: Beef Cattle, Horses, Sheep, and Swine.* Second term. Two lecture and laboratory periods a week.

43. *Advanced Livestock Judging: Beef Cattle, Horses, Sheep, and Swine.* First term. Two lecture and laboratory periods a week.

50. *Dairy Cattle.* Second term. Two lectures and one laboratory period a week.

51. *Advanced Judging, Dairy Cattle.* Second term. Hours by appointment.

60. *Beef Cattle.* Second term. Two lectures and one laboratory period a week.

70. *Swine.* Second term. Two lectures and one laboratory period a week.

80. *Sheep.* First term. Two lectures and one laboratory period a week.

90. *Meat and Meat Products.* First or second term. One lecture and two laboratory periods a week.

93. *Meat Cutting.* First or second term. One period a week.

110. **Principles of Nutrition.** First term. See **Animal Nutrition.**

111. **Laboratory Work in Nutrition.** First term. Laboratory course. See **Animal Nutrition.**

120. **Problems in Animal Breeding.** First term. Given in alternate years. See **Animal Breeding.**

125. **Endocrinology, Reproduction, and Lactation.** Second term. See **Animal Breeding.**

126. **Problems in Animal Physiology.** First term. Given in alternate years. See **Animal Breeding.**

213. **Biochemistry of Lactation.** Second term. Given in alternate years. See **Animal Nutrition.**

214. **Special Topics in Animal Nutrition.** Second term. Given in alternate years. See **Animal Nutrition.**

215. **History of Nutrition.** First term. See **Animal Nutrition.**

219. **Seminar in Animal Nutrition.** First and second terms. See **Animal Nutrition.**

229. **Seminar in Animal Breeding.** First and second terms. See **Animal Breeding.**

150. **Dairy Cattle, Advanced Course.** Second term. Credit two hours. Prerequisite, course 50. Professor HARRISON. Lecture, T 11. Practice, T 1:40–4. Wing E.

Analysis of breeding operations in successful breeding establishments. Formulating a breeding program. Selection of foundation females and herd bulls and special problems in the feeding and management of the purebred dairy herd.

200. **Research.** First and second terms. Professors MORRISON, SAVAGE, HARRISON, HINMAN, MILLER, SALISBURY, and WILLMAN. Hours by arrangement.

201. **Seminary in Animal Husbandry.** First and second terms. Required of all graduate students taking either a major or minor subject in Animal Husbandry. Professor MORRISON and departmental staff. M 11.

ANIMAL NUTRITION

See under ANIMAL SCIENCES, p. 80.

BACTERIOLOGY

See under PLANT SCIENCES, p. 94, and NEW YORK STATE EXPERIMENT STATION AT GENEVA, p. 197.

DAIRY SCIENCE

Professors J. M. SHERMAN, H. E. ROSS, P. F. SHARP, B. L. HERRINGTON, E. S. GUTHRIE, W. E. AYRES, H. J. BRUECKNER, D. B. HAND, and V. N. KRUKOVSKY; at Geneva, *Professors* A. C. DAHLBERG, D. C. CARPENTER, J. C. HENING, and J. C. MARQUARDT.

Approved Major and Minor Subjects (key to symbols on p. 41)

Dairy Science 1, 2, 3, 4
Dairy Chemistry 1, 2, 3, 4
Biochemistry 1, 2, 3, 4

Before taking up graduate work in dairy science, it is desirable that the student have general chemistry, qualitative and quantitative analysis, organic chemistry, college physics, and general bacteriology, in addition to the elementary courses in the particular field in which he wishes to do his graduate work.

Formal courses open to undergraduate and graduate students are given in the following subjects:

1. *Introductory Dairy Science.* Either term. Credit three hours a week.

5. *Technical Control of Dairy Products.* Second term. One hour a week.

102. **Market Milk.** Second term. Credit five hours. Prerequisites, course 1, and Bacteriology 1 or its equivalent. Professors Ross and BRUECKNER. Lecture

and laboratory practice, T Th 12:30–5:30. Dairy Building 119 and 146. Laboratory fee, $10.

The scientific, technical, and sanitary aspects of the fluid milk industry.

103. **Milk-Products Manufacturing.** First term. Credit five hours. Prerequisite, course 1. Professor GUTHRIE and Assistant Professor AYRES. Lectures, recitations, and laboratory practice, T Th 10–3:30. Dairy Building 120. Laboratory fee, $10.

The principles and practice of making butter, cheese, and casein, including a study of the physical, chemical, and biological factors involved.

104. **Milk-Products Manufacturing.** Second term. Credit five hours. Prerequisite, course 1; should be preceded or accompanied by course 5. Assistant Professor AYRES. Lectures, recitation, and laboratory practice, F 12–5, S 8–1. Dairy Building 120. Laboratory fee, $10.

The principles and practice of making condensed and evaporated milk, milk powders, ice cream, and by-products, including a study of the physical, chemical, and biological factors involved.

111. **Analytical Methods.** Second term. Credit four hours. Prerequisite, quantitative analysis. Professor HERRINGTON and Assistant Professor KRUKOVSKY. Lectures, T Th 10. Laboratory practice, T 1–5. Dairy Industry Building 120. Laboratory fee, $10.

An advanced course in the chemical analysis of products and materials important in the dairy industry.

112. **Chemistry of Biological Materials.** First term. Credit three hours. Prerequisites, analytical and organic chemistry, and college physics. Associate Professor HAND. M W F 12. Dairy Building 119.

A fundamental treatment of the physico-chemical processes occurring in living cells and other biological materials.

113. **Chemistry of Milk.** First term. Credit two hours. Prerequisites, qualitative and quantitative analysis and organic chemistry; must be preceded or accompanied by course 112 or its equivalent. Professor P. F. SHARP. Lectures, M W 8. Dairy Building 119.

A consideration of milk and dairy products from the physico-chemical point of view.

Dairy Bacteriology. (See Bacteriology 103.)

220. **Chemistry of Milk Products.** Second term. Credit four hours. Must be preceded by course 113. Professor P. F. SHARP. Lectures, M T W Th 8. Dairy Building 218.

An advanced consideration of the scientific and technical aspects of milk products.

252. **Seminary.** Throughout the year. Without credit. Required of graduate students specializing in the department. Professor SHERMAN. Hours to be arranged. Dairy Building.

For Graduates

Graduate students may elect research problems in any of the various fields of dairy science and in related fields of bacteriology and biochemistry.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

Research work in dairying is also available to graduate students at Geneva. For further information see page 198.

FLORICULTURE AND ORNAMENTAL HORTICULTURE

Professors L. H. MACDANIELS, R. W. CURTIS, J. P. PORTER, KENNETH POST, R. C. ALLEN and A. M. S. PRIDHAM; and *Doctor* L. G. COX.

Approved Major and Minor Subjects (key to symbols on p. 41)

Floriculture and Ornamental Horticulture 1, 2, 4

The field of research in floriculture and ornamental horticulture affords excellent

opportunities for original work. Studies in the propagation, nutrition, culture, and improvement of ornamental plants may be undertaken. Also monographic studies of ornamental groups and their adaptability to use are suitable problems for investigation.

Most of the problems in this field are basically those of plant response with relation to environment and thus the student majoring in the department should have adequate preparation in Botany, Plant Physiology, Genetics, Agronomy, Plant Pathology, Entomology, Chemistry, and elementary Floriculture and should have had experience in the growing and handling of horticultural material. Minor subjects should be chosen in the above-named basic science fields. A candidate for the doctor's degree may find it expedient to arrange a joint major in Floriculture and one of the basic science departments. Under these circumstances the problem would be worked out with horticultural material under the joint supervision of committeemen from the two departments.

The greenhouse, nursery, plant materials, and laboratory facilities of the department are adequate for research in practically any phase of the field. This, with the strong departments in the basic sciences gives an outstanding opportunity for graduate work with ornamental plants at Cornell.

1. *General Floriculture and Ornamental Horticulture.* First term. Two lectures and one laboratory period a week.

2. *Introduction to Landscape Design.* Second term. Three lectures a week.

5. *Flower Arrangement.* Second term. One lecture and one laboratory period a week.

10. *Taxonomy of Cultivated Plants.* First term. One lecture and two laboratory periods a week.

12. *Herbaceous Plant Materials.* Second term: two lectures and one laboratory period a week.

13. *Woody Plant Materials.* Second term. Two lectures and two laboratory periods a week.

32. *Elementary Landscape Planning and Planting of Small Properties.* First term. One lecture and two laboratory periods a week.

112. *Herbaceous Plant Materials,* advanced course. First term. One laboratory period a week.

113. *Woody Plant Materials,* advanced course. First term. Two laboratories a week.

114. *Turf.* Second term. One lecture and one laboratory period a week.

115. *Plant Propagation.* First term. Two lectures and one laboratory period a week.

125. *Flower Store Management.* Second term. One lecture and one laboratory period a week.

123. **Commercial Greenhouse Production.** First term. Credit four hours. Prerequisites, courses 1 and 115, Botany 31, Agronomy 1, and the practice requirement. Associate Professor POST and Mr. SEELEY. Lectures and recitation, M W F 9. Plant Science 37. Laboratory, W 1:40–4. Greenhouses. Laboratory and transportation fee, $7.

A comprehensive study of the application of basic science to the culture of ornamental plants.

124. **Commercial Greenhouse Production.** Second term. Credit three hours. Prerequisite, course 123. Associate Professor POST and Mr. SEELEY. Lectures, M W 9. Plant Science 37. Laboratory, W 1:40–4. Greenhouses. Laboratory and transportation fee, $2.

A course supplementary to course 123 dealing with the study of the commercial production of florists' crops with emphasis on the practical problems concerned. A trip is made to nearby commercial greenhouses.

119. **Outdoor Culture of Ornamental Plants.** Second term. Credit three hours. Prerequisites, Botany 31 and Floriculture 12, 13, and 115. Professor PRIDHAM. Lectures, T Th 11. Plant Science 37. Laboratory, F 1:40–4. Laboratory fee, $2.50.

A study of the principles and practices employed in the production of plants in

the nursery and in transplanting, fertilizing, pruning, and winter protection of landscape materials.

132. **Landscape Planning and Planting of Small Properties.** Both terms. Credit four hours a term. Prerequisites, courses 1, 2, 12, 13, 32, and Drawing 15. Associate Professor PORTER and Mr. BAIRD. Lectures, T Th 10. Plant Science 141. Two laboratories. Laboratory fee, $5.

An advanced course in the design of small properties to follow course 32.

134. **Construction and Planting of Small Gardens.** First term. Credit three hours. Intended for advanced students specializing in landscape service. Prerequisite, course 132. Associate Professor PORTER and Mr. BAIRD. Lecture, Th 9. Plant Science 143. Two laboratories. Plant Science 433. Laboratory fee, $3.

A study of the design, construction, and planting of intimate garden areas with special attention to plant and flower combinations.

241. **Seminar.** First term. One hour to be arranged. Required of all graduate students in the department and recommended for senior majors. Plant Science 37.

FORESTRY

Professors A. B. RECKNAGEL and E. F. WALLIHAN.

Approved Major and Minor Subjects (key to symbols on p. 41)

Forest Conservation 2, 4
Forest Products 2, 4
Forest Ecology 2, 4

Graduate Work in Forestry

Instruction and research in forestry on the graduate level leading to advanced professional degrees in forestry have been discontinued.

Graduate students, candidates for the degrees Master of Science or Doctor of Philosophy, may elect to do work of non-professional character in forestry. Prospective graduate students should correspond with the Dean of the Graduate School in order to ascertain the availability of work desired.

Cornell University owns or controls various properties which offer exceptional opportunities for graduate study in all natural science fields. Among these are the following forest properties: The Arnot Forest of 3800 acres, twenty miles southwest of Ithaca; other parcels of wooded and open land aggregating approximately 670 acres in the vicinity of Ithaca; and 640 acres of typical Adirondack timber land in Essex and Hamilton counties.

Advanced Work and Research

Advanced work and research of a non-professional character may be done in the following:

Forest Conservation (History and Policy)—Professor ————.
Forest Products—Professor RECKNAGEL.
Forest Ecology—Assistant Professor WALLIHAN.

General Forestry

1. *Farm Woodlands.* First term. Three hours a week.
2. *Utilization of Farm Woodland Products.* Second term. Two hours a week.
3. *Conservation of Natural Resources.* Second term. Two hours a week.

[4. *The Field of Forestry.* First term. Two hours a week. Not given in 1942–43.]

23. *Establishment and Development of Farm Woodlands.* Second term. Three hours a week.

54. *Measurement and Management of Farm Woodlands.* First term. Three hours a week.

[166. **Wildlife Conservation in Relation to Forestry.** For graduate and undergraduate students. First term. Credit two hours. Prerequisite, Wildlife Conservation and Management 2. Professor ————. Not given in 1942–43.]

A consideration of the place of wildlife conservation and management in the multiple purpose programs which govern the full and rounded use of national, state, and private forests.

291. **Seminar.** Both terms. Without credit. Professor RECKNAGEL and Assistant Professor WALLIHAN. Hours to be arranged. Field and classroom conferences.

POMOLOGY

Professors A. J. HEINICKE, M. B. HOFFMAN, R. M. SMOCK, and DAMON BOYNTON; at Geneva, *Professors* RICHARD WELLINGTON, H. B. TUKEY, R. C. COLLISON, and B. R. NEBEL.

Approved Major and Minor Subjects (key to symbols on p. 41)

Pomology 1, 2, 4

The large experimental and varietal orchards of different fruits at Ithaca and at Geneva are available for graduate use. Representative varieties of all domesticated species that grow in this climate may be found in these orchards. Each year a large collection of exotic fruit is brought together at the College; herbarium and preserved material is also available. The important pomological literature required for research is found in the libraries at Cornell and at the State Station. Modern apparatus for research work on pomological problems involving chemical, histological and physiological technique is available in the departmental laboratories. Opportunity for investigation of fruit storage problems is afforded by a modern cold storage plant which is equipped for experimental purposes.

Special facilities for research work in fruit breeding, nursery stock investigations, and other phases of pomology are also available to graduate students at Geneva. For further information, see page 199.

In order to enter upon graduate work in Pomology, the student should have the equivalent of the following courses: General Botany, Elementary Plant Physiology, Economic Entomology, Elementary Plant Pathology, Introductory Inorganic and Elementary Organic Chemistry, Elementary Pomology, and Systematic Pomology. In addition, students are required as part of their graduate work in Pomology to take advanced courses in Plant Physiology and Chemistry, unless minors are chosen in those subjects. They are urged, however, to choose a minor in some phase of Botany, particularly Plant Physiology.

On account of the nature of the work, it is very desirable that graduates studying for the Master's degree should spend one summer at Ithaca or Geneva or in the field investigating their special subject. This is expected of graduates working for a Doctor's degree.

1. *General Pomology.* First or second term. Credit three hours.
2. *Fruit Varieties.* First term. Credit two hours.

111. *Handling and Storage of Fruit for Market.* First term. Credit two hours.

112. *Advanced Laboratory.* Second term. Credit two hours.

[121. **Economic Fruits of the World.** First term. Professor ————. Lectures, T Th 12. Laboratory, F 1:40–4. Plant Science 107. Given in alternate years, not in 1942–43.]

A study of all species of fruit-bearing plants of economic importance, such as the date, the banana, the citrus fruits, the nut-bearing trees, and the newly introduced fruits, with special reference to their cultural requirements in the United States and its insular possessions. All fruits not considered in other courses are considered here. The course is designed to give a broad view of world pomology and its relationships with the fruit industry of New York State.

131. **Advanced Pomology.** Second term. Credit four hours. Prerequisites, Pomology 1 and 2 and Botany 31. Professor HEINICKE. Lectures, M W F 10. Conference, W 11. Plant Science 141. Given in alternate years.

A systematic study of the sources of knowledge and opinion as to practices in pomology. The results of experiences and research pertaining to pomology are discussed with reference to their application in the solution of problems in modern fruit growing.

231. **Special Topics in Experimental Pomology.** Second term. Credit three hours. Prerequisite, Pomology 131. Professor HEINICKE. Conference periods, M W F 10. Plant Science 141. Given in alternate years.

In this course the student is expected to review critically and evaluate the more important original papers relating to pomological research. Interpretation of the literature will be made on the basis of the fundamental principles of plant biology. Modern experimental methods applicable to the field of pomology are fully considered.

201. **Research Problems in Pomology.** Throughout the year. Professors HEINICKE, HOFFMAN, SMOCK, and BOYNTON.

200. **Seminary.** First and second terms. Members of the staff. M 11. Plant Science 404.

POULTRY HUSBANDRY

Professors J. H. BRUCKNER, R. K. COLE, G. O. HALL, G. F. HEUSER, F. B. HUTT, W. F. LAMOREUX, L. C. NORRIS, A. L. ROMANOFF.

Approved Major and Minor Subjects (key to symbols on p. 41)

Poultry Husbandry 2, 4

The department provides excellent facilities for research in the genetics, physiology, incubation, embryology, nutrition, and behavior of domestic birds. A flock of over 4000 birds of various breeds of the domestic fowl is maintained, and turkeys, ducks, geese, and game birds can be obtained when needed. The equipment includes the usual facilities for hatching, brooding, and rearing poultry, together with laying houses and pens for experimental work. There is a well-equipped chemical laboratory and complete facilities for work in poultry nutrition, equipment for studies of incubation and facilities for various kinds of histological and physiological work.

The accumulated records of the department are available for study, and other extensive data are provided by two laying tests conducted under the supervision of the department.

Students for the Ph.D. degree in this department may elect either Animal Breeding or Animal Nutrition as the major field of study. For requirements and courses in these fields, see pp. 78 and 80 of this publication. Animal Breeding and Animal Nutrition may also be elected as major or minor fields of study for the M.S. degree.

Poultry Husbandry may be elected as a major for the M.S. degree and as a minor for the M.S. or Ph.D. degree when the major is taken in a field of study other than Animal Breeding or Animal Nutrition.

The prerequisites for graduate students electing a major subject in this department include some undergraduate training in poultry husbandry, some experience in that field, courses in zoology or animal biology, physiology, and chemistry, as well as permission of the major adviser.

1. *Farm Poultry.* First term. Credit three hours.

20. *Poultry Breeds, Breeding, and Judging.* First term. Credit three hours.

30. *Poultry Incubation and Brooding.* Second term. Credit three hours.

50. *Marketing Poultry Products.* Second term. Credit two hours.

110. *Poultry Nutrition.* Second term. Credit three hours.

170. *Poultry Hygiene and Disease.* First term. Credit two hours.

120. **Poultry Genetics.** Second term. For details see Animal Breeding.

121. **Physiology of Avian Reproduction.** Second term. For details see Animal Breeding.

140. **Anatomy of the Fowl.** First term. Credit two hours.

209. **Seminar in Poultry Biology.** Throughout the year. Members of departmental staff. F 4:15. Rice 201. Required of all graduate students in the department.

A survey of recent literature and research in poultry biology.

210. **Experimental Methods in Poultry Nutrition.** First term. For details see Animal Nutrition.

219. **Animal Nutrition Seminar.** First and second terms. For details see Animal Nutrition.

220. **Animal Genetics.** First term. For details see Animal Breeding.

229. **Seminar in Animal Breeding.** First and second terms. For details see Animal Breeding.

RURAL SOCIOLOGY

See under SOCIOLOGY, p. 73.

VEGETABLE CROPS

Professors H. C. THOMPSON, PAUL WORK, E. V. HARDENBURG, ORA SMITH, HANS PLATENIUS, and G. J. RALEIGH; at Geneva, *Professors* C. B. SAYRE, W. T. TAPLEY, and W. D. ENZIE.

Approved Major and Minor Subjects (key to symbols on p. 41)

Vegetable Crops 1, 2, 4

Opportunity is offered for research in such lines of vegetable growing and handling as the student may select. There are excellent opportunities for original work on this subject.

The facilities available include the regular classrooms and laboratories; research laboratories, with the necessary equipment for chemical and physiological work; cold storage and common storage rooms; greenhouse space of approximately 7,500 square feet; hotbeds and cold frames; and about 25 acres of land devoted to teaching and research work. Special equipment is obtained as needed for students majoring in this field.

In order to enter upon graduate work in this field, the student should have the equivalent of the following courses: Botany 1 and 31, Plant Pathology 1, Entomology 12, Agronomy 1, Vegetable Crops 1, 2, 12. These courses are outlined in the *Announcement of the College of Agriculture*. In case a student has not had all of these courses, he should take them early in his period of graduate study. Students taking either a major or a minor in vegetable crops are required to take the courses 101, 113, 225, and to attend the seminar.

Students majoring in vegetable crops will ordinarily find it necessary to spend at least one summer in Ithaca, in order to grow and study plant materials used in their research work.

1. *Vegetable Crops.* Second term. Credit three hours.

2. *Special Cash Crops.* Second term. Credit three hours. Botany 1 should precede or accompany this course.

12. *Grading and Handling Vegetable Crops.* First term. Credit three hours.

101. **Advanced Vegetable Crops.** First term. Credit four hours. Prerequisites, course 1 and Botany 31. Professor THOMPSON. Lectures, M W F 9. One conference period to be arranged. East Roberts 223.

This course is devoted to a systematic study of the sources of knowledge and opinions as to practices in vegetable production and handling. Results of experiments that have been concluded or are being conducted are studied and their application to the solution of practical problems is discussed.

113. **Types and Varieties of Vegetables.** First term. Credit three hours. Prerequisite, course 1 or 2 or permission to register. Professor WORK. Lecture and laboratory, M 1:40–4:40. East Ithaca gardens or East Roberts 223. Laboratory fee, $2.

One week of laboratory work preceding the beginning of regular instruction is required from September 24 to 30, 1942. Report at East Roberts at 9 a.m., September 24. The department should be notified of intention to register in this course.

This course deals with the taxonomy, origin, history, characteristics, adaptation, identification, classfication, exhibition, and judging of kinds and varieties

of vegetables; the characteristics, production, and handling of vegetable seeds. The leading varieties of the vegetable crops are grown each year. The value of the course depends to a great extent upon gaining an acquaintance with the plant material as it grows. For this reason, part of the laboratory work is done in the gardens prior to and during registration week.

225. **Special Topics in Vegetable Crops.** Second term. Credit three hours. Prerequisites, course 101 and Botany 31. It is recommended that Botany 231 and 232 precede or accompany this course. Professors THOMPSON, RALEIGH, SMITH, and PLATENIUS. Discussions, M W F 9. East Roberts 223. Given in alternate years.

In this course, intended primarily for graduate students, the student is expected to review critically and to evaluate the more important research publications that deal with vegetable production, handling, and storage problems. In the discussions, attention will be given to research methods and technique.

231. **Research.** Members of the staff are prepared to direct investigations in the various lines of vegetable production and handling.

232. **Seminar.** First and second terms. Members of the department staff. Recent literature is taken up for general study and discussion. All graduate students in vegetable crops are required to take part in this seminar. Time to be arranged. East Roberts 223.

RESEARCH AT THE NEW YORK STATE EXPERIMENT STATION

Research work in vegetable crops is also available at Geneva. For further information see page 199.

SCHOOL OF EDUCATION

EDUCATION AND RURAL EDUCATION

Professors H. R. ANDERSON, T. L. BAYNE, C. E. BINZEL, J. E. BUTTERWORTH, T. H. EATON, L. A. EMERSON, E. N. FERRISS, F. S. FREEMAN, E. R. HOSKINS, M. L. HULSE, P. G. JOHNSON, P. J. KRUSE, C. B. MOORE, R. A. OLNEY, E. L. PALMER, A. Y. REED, W. A. SMITH, R. M. STEWART, F. M. THURSTON, and A. L. WINSOR.

Approved Major and Minor Subjects for A.M., M.S., M.S. in Agr., and Ph.D.

(key to symbols on p. 41)

Agricultural Education 1, 2, 3, 4
Curriculum 1, 2, 3, 4
Education 3, 4
Educational Administration 1, 2, 3, 4
Educational and Mental Measurement (including Statistics) 2, 3, 4
Educational Method 3, 4
Educational Psychology 1, 2, 3, 4
History of Education 2, 3, 4
Home Economics Education 1, 2, 3, 4
Industrial Education 1, 2, 3, 4
Nature Study 1, 2, 3, 4
Rural Education 1, 3, 4
Rural Secondary Education 1
Science Education 1, 2, 3, 4
Secondary Education 1
Social Studies Education 1, 2, 3, 4
Supervision 1, 2, 3, 4
Theory and Philosophy of Education 1, 2, 3, 4
Vocational Education 1

There are two types of advanced degrees for which students in Education may become candidates, as follows:

1. The degrees of *Master of Arts, Master of Science, Master of Science in Agriculture,* and *Doctor of Philosophy,* administered by the Graduate School.

2. The degrees of *Master of Science in Education* and *Master of Education,* administered by the School of Education under the jurisdiction of the Graduate School.

A separate Announcement listing the offerings in Education may be obtained by writing to the Director of the School of Education, 211 Stone Hall.

Admission

A student may be admitted to candidacy for any of the degrees Master of Arts, Master of Science, Master of Science in Agriculture, or Doctor of Philosophy, with a major or minor, or both, in some phase of Education. For details of admission see page 12.

The requirements for admission to candidacy for Master of Science in Education are the same as for Master of Arts or Master of Science, except that there is no requirement in foreign language.

Requirements for admission to candidacy for the degree of Master of Education will be announced later.

Persons interested in becoming candidates for these degrees should address inquiries to the Director of the School of Education. Formal application for admission should be sent to the Dean of the Graduate School.

The Degree of Master of Education

The student who enters the University with the intention of preparing for secondary school teaching will be expected to complete a five-year program. He will register in one of the undergraduate colleges and at the end of four years will normally receive a Bachelor's degree. Upon the satisfactory completion of the five-year program, the professional degree, Master of Education, will be awarded.

The Degree of Master of Science in Education

The various programs leading to this degree are planned primarily for those who, having had experience in teaching or other type of educational work, wish to prepare themselves for such specialized forms of service as supervision, counseling, or the administration of an elementary, secondary, vocational, or technical school. For the present, teachers of industrial arts and of industrial and technical subjects should also ordinarily seek this degree. Information regarding requirements for admission to candidacy for this degree will be found in the *Announcement of the School of Education.*

For information regarding rooms in which classes will be held see the Announcement of the School of Education.

PRE-PROFESSIONAL AND PROFESSIONAL COURSES FOR SECONDARY SCHOOL TEACHERS

Introduction to Social Science, A, B. Throughout the year. Credit three hours a term.

Human Growth and Development. Throughout the year. Credit three hours a term.

100. *Educational Psychology.* (Ed. and R.E.) Either term. Credit three hours.

120. *Social Foundations of Education.* (Ed. and R.E.) Either term. Credit three hours.

130. *The Art of Teaching.* (Ed. and R.E.) Throughout the year. Credit five hours a term.

130a. *The Art of Teaching.* (Ed. and R.E.) First term. Credit five to ten hours.

131. *Introduction to Teaching in Vocational Agriculture.* (R.E.) Either term. Credit three hours.

132. *The Teaching of Agriculture in the Secondary School.* (R.E.) Throughout a full year in two sequences beginning in either term. Credit three or four hours each term for a total of seven hours.

135. *The Teaching of Home Economics in the Secondary School.* (R.E.) Either term. Credit three to five hours.

136. *Directed Teaching of Home Economics in the Secondary School.* (R.E.) Either term. Credit four to six hours.

200. **Apprentice Teaching.** (Ed. and R.E.) An eight-week period off-campus to be arranged. Credit six hours. Professor BINZEL, Associate Professors HULSE and HOSKINS, Assistant Professor OLNEY, and Mr. ELDRED, and members of the staff. Required of all candidates for the M.Ed. degree. Prerequisite: satisfactory completion of the first four years of the five-year program, or the equivalent, or special permission.

Students will be assigned to cooperating schools so selected as to provide the most favorable conditions for this type of experience. They will be expected to carry a half-time teaching program including the usual related responsibilities of the teacher. Preparation for teaching and work on special problems under the direction of University instructors will occupy the remainder of the student's time. Each student will be under the immediate supervision of the principal, of a competent local teacher, and of a member of the staff of the School of Education.

210. **Special Problem in Teaching.** (Ed. and R.E.) Either term. Credit two hours. Members of the staff.

A critical study of some phase of teaching undertaken during the period of apprentice teaching

220. **Philosophy of Education.** (Ed. and R.E.) Credit two hours. Offered for an eight-week period during the second term at such time as will not interfere with the student's apprentice teaching. Time and place of meeting to be arranged. Professor EATON.

For fifth year students in preparation for secondary school teaching under the five-year program. A coordinating course in the professional sequence designed chiefly to develop a critical appreciation of teaching enterprise. It centers, therefore, upon the question of values in education and calls for examination and judgment of aims and content from that standpoint. Every student is required to undertake a study in valuation of the teaching enterprise in his own field of specialization.

GENERAL COURSES

Ed. 20. **Seminar in Human Development and Behavior.** First term. Credit two hours. Primarily for graduate students. Seniors may be admitted with permission of instructor. Professor FREEMAN. Th 4–6.

Topics relevant to educational theory and practice.

R.E. 234. **Seminar.** First term. Credit two hours. Open to graduate students contemplating research in education, and who have permission to register. Associate Professor W. A. SMITH. W 2–4.

A consideration of scientific method applied in education through graduate studies and other educational research.

EDUCATIONAL PSYCHOLOGY

R.E. 110. *Psychology: An Introductory Course.* Either term. Credit three hours.

R.E. 112. *Psychology for Students of Education.* Either term. Credit three hours.

Psychology for Students of Hotel Administration. (*Hotel Administration* 114.) First term. Credit three hours.

R.E. 117. *Psychology of Childhood and Adolescence.* Either term. Credit three hours.

Personnel Administration. (*Hotel Administration* 119.) Second term. Credit three hours.

Ed. 8. **Experimental Educational Psychology.** Either term. Credit and hours to be arranged. Consent of the instructor is required. Education 7 or its equivalent should normally precede this course. Professor FREEMAN.

The application of psychological and statistical methods to problems in education.

[Ed. 17. **Mental Development.** First term. Credit two hours. Professor FREEMAN. Not given in 1942–43.]

[Ed. 18. **Individual Differences.** Second term. Credit three hours. Prerequisite, a course in general or educational psychology. It is desirable, though not required, that Education 7 precede this course. Professor FREEMAN. M 2–4, and a third hour to be arranged. Not given in 1942–43.]

The nature, causes, and implications of individual differences in abilities and behavior. Study and observation of atypical groups.

R.E. 211a. **Psychology for Students of Education.** First term. Credit three hours. For mature students with teaching experience. Professor KRUSE. M F 11–12:20.

R.E. 212. **Psychology of Learning.** Second term. Credit two hours. Professor KRUSE. Th 4:00–5:45.

R.E. 213. **Psychology of Learning in the School Subjects.** First term. Credit two hours. Prerequisites, a course in educational psychology and permission of the instructor. Assistant Professor BAYNE. S 9–11.

[R.E. 218. **Seminar in Educational Psychology.** Second term. Credit two hours. Professor KRUSE. Not given in 1942–43.]

Seminar in Personnel Administration. (**Hotel Administration** 219.) Second term. Credit two hours. Prerequisite, *Hotel Administration* 119. Professor WINSOR. Th 4:15–6.

METHOD

R.E. 127. *Observational Aids in Teaching.* Second term. Credit two hours.

[R.E. 129. *Teaching Adaptations for the Atypical Child.* Second term. Credit three hours. Not given in 1942–43.]

[R.E. 134. *Adult Education.* First term. Credit three hours. Not given in 1942–43.]

R.E. 134a. *Special Education for Out-of-School Youths and Adults.* Second term. Credit two hours.

R.E. 134b, 134c. *Adult Homemaking Education.* (*Leadership in Home Economics.* H.E. 430 and H.E. 440.)

134b (H.E. 430) *Organization and Policies.* Second term. Credit three hours.

134c (H.E. 440) *Program Planning and Methods.* First term. Credit three hours.

R.E. 226. **Research in Science Teaching.** Either term. Credit one or two hours a term. Professor PALMER and Assistant Professor JOHNSON. M 4:30.

Special problems in science teaching.

R.E. 227. **Seminar in Elementary Education.** Second term. Credit two hours. S 9–11.

R.E. 228. **Seminar in Child Guidance.** (Family Life 350.) Second term. Credit two hours. Professor WARING. F 4–6.

For graduate students who have had some work in child guidance.

Ed. 230. **Seminar in Social Studies Education.** Either term. Credit as arranged. Associate Professor ANDERSON. M 4:15.

Students working on critical papers, theses, or other research in the field may register for this course.

[R.E. 232. **Advanced Problems in the Teaching of Vocational Agriculture.** Second term. Credit two hours. Associate Professor HOSKINS. Not given in 1942–43.]

R.E. 235. **Seminar in Teaching Home Economics.** Second term. Credit two hours. Students will need to consult the instructor before registering. Professor THURSTON. Hours to be arranged.

This course provides opportunity for graduate study of methods in home economics education and for field work. It is intended for secondary school teachers, extension workers, college teachers, and leaders in home economics. Individual problems may include experiments, observation, and practice in teaching and supervision. It is especially recommended in connection with courses R.E. 248, R.E. 249, and R.E. 269.

R.E. 249. **Seminar in Home Economics Education.** First and second terms. Credit two to four hours either term. Total credit for the year not to exceed six hours. Students will need to consult the instructor before registering. Professor THURSTON. Hours to be arranged. Field work will be required.

Designed to meet the needs of graduate students who have had experience as home economics educators in schools, colleges, extension service, business, etc. Arrangements will be made for students to work on their individual problems. Courses in philosophy and principles of education, psychology, guidance, curriculum, and measurement are recommended as prerequisites or parallel.

PREPARATION OF TEACHERS FOR NORMAL SCHOOLS AND COLLEGES

B 35. **Problems in Educational Personnel and Guidance.** Second term. Credit four hours. Planned for graduate students. Dr. REED. W 4–6.

This is a conference course on personnel problems, designed to serve students who are interested in advisory work on any level of education, including the adult field. Topics will include: Selective Admission, Orientation, Incentives to Scholarship, Educational and Vocational Adjustment Problems, Social and Health Problems, Administration of Personnel Service, etc.

R.E. 241. **The Preparation of Teachers for Normal Schools and Colleges.** Second term. Credit two hours. Professor MOORE. W 4–6.

R.E. 245. **The College Preparation of Teachers of Agriculture for the Secondary School.** Second term. Credit three hours. Should follow course 211a or its equivalent. T Th 11–12:30. Professor STEWART.

A course designed to study critically in the light of the teaching of agriculture in junior and secondary schools the programs of teacher education in the colleges of agriculture.

[R.E. 248. **The Preparation of Teachers of Home Economics for Secondary Schools.** Second term. Credit two hours. Professor THURSTON. Not given in 1942–43.]

R.E. 250. **Seminar in Agricultural Education.** First or second term. Credit two hours. For teachers of agriculture and students whose progress in graduate study is satisfactory. First term, Professor STEWART and Assistant Professor OLNEY. T 4–5:30.

A critical study of state plans of vocational education in agriculture with particular reference to the utilization of school and community activities and organizations.

MEASUREMENT AND STATISTICS

Ed. 7. **Mental Measurements.** First term. Credit three hours. Prerequisite, a course in general or educational psychology or human growth and development. Professor FREEMAN. T Th S 9.

Development of individual and group tests of intelligence and personality; principles underlying their construction and use; their use in schools, psychological clinics, and in other fields. The nature of mental abilities. Use of educational tests. Demonstrations in administering and interpreting tests.

R.E. 251. **Educational Measurement.** Second term. Credit three hours. Candidates for the principal's certificate may register for two hours' credit. Prerequisite, a course in educational psychology. Assistant Professor BAYNE. S 11–12:30 and an additional hour to be arranged.

The use of aptitude and achievement tests and other measuring instruments in the classification and guidance of pupils, improvement of instruction, and other activities of the teacher and school officer. Those class members who wish may make a study of their own aptitudes and achievements.

R.E. 253. **Introduction to Educational Statistics.** First term. Credit three hours. Assistant Professor BAYNE. T Th 10 and an hour to be arranged.

A study of common statistical procedure in relation to critical reading of technical studies, research, and writing reports of studies. As far as possible the work is related to the problems of the individual student.

R.E. 253a. **Statistical Instruments in Education.** Second term. Credit two hours. Prerequisite, a first course in statistics and permission of the instructor. Assistant Professor BAYNE. T 10.

ADMINISTRATION AND SUPERVISION

Ed. 5. **High School Administration.** Second term. Credit two hours. Professor FERRISS. M W 2.

A course in the organization and administration of the secondary school.

[Ed. 11. **Extra-classroom Activities.** First term. Credit two hours. Professor ————. Not given in 1942–43.]

[Ed. 12. **The Junior High School.** First term. Credit three hours. Professor ————. Not given in 1942–43.]

A 28. **Educational and Vocational Guidance.** First term. Credit two hours. Planned primarily for graduate students but a small number of undergraduates with a background of experience may be admitted upon permission of the instructor. Dr. REED. W 4–6.

This is an information course. It is designed to familiarize students with (1) the history, principles, and place of guidance in a democratic society, (2) methods of collecting, classifying, interpreting, and disseminating various types of information essential to a successful guidance program (educational, occupational, community, etc.), (3) placement procedures and employment supervision.

R.E. 246. **Problems in Industrial and Technical Education.** First and second terms. Credit four hours each term. Professor EMERSON. T Th 2–4.

Special problems in the administrative, supervisory, and curricular phases of industrial and technical education.

R.E. 261. **The Administration of Rural Schools.** First term. Credit three hours. Professor BUTTERWORTH. T Th 11.

A consideration of the main problems in the administration of schools in communities under 4500 population.

[R.E. 262a. **School Finance.** Second term. Credit two hours. Professor BUTTERWORTH. Not given in 1942–43.]

[R.E. 262c. **The School Plant.** Second term. Credit two hours. Professor BUTTERWORTH. Not given in 1942–43.]

R.E. 263. **Procedures and Techniques in Supervision.** First term. Credit three hours. Candidates for the principal's certificate may register for two hours' credit. Professor MOORE. M W F 10.

Designed for superintendents, supervisors, and principals. Students who have not had experience in these fields will be admitted only upon permission of the instructor. Students taking this course must be prepared to spend four full days or more in observing supervisory procedures in various school systems.

R.E. 264. **Seminar in Rural School Administration.** Second term. Credit two hours. Professor BUTTERWORTH. S 10–11:30.

Topic to be announced.

R.E. 265. **Seminar for Principals.** First term. Credit two hours. Required of all graduate students who are candidates for a principal's certificate. Professor FERRISS. S 11–1.

R.E. 266. **The Supervision of the Elementary School.** Second term. Credit three hours. Candidates for a principal's certificate may register for two hours' credit. Professor MOORE. M W F 9.

A course designed for supervisors, elementary school principals, and superintendents. It includes a consideration of important research studies which have a direct bearing upon the teaching and supervision of the elementary school subjects.

[R.E. 267. **The Organization and Administration of Vocational Agriculture in the Public Schools.** Second term. Credit three hours. Should follow or accompany Course 261. Professor STEWART. Not given in 1942–43.]

R.E. 269. **The Supervision of Home Economics Education.** Second term. Credit two hours. Students will need to consult instructor before registering. Professor THURSTON. Hours to be arranged. Field work will be required.

For persons who are now engaged in supervision and in the education of teachers and leaders in service and for those who wish to prepare for such work.

R.E. 276. **Principles of Curriculum Building.** Second term. Credit three or four hours. Primarily for graduate students. Professor FERRISS. T Th 2–3:30 and an additional hour to be arranged for those wishing to carry further study of curriculum problems.

A consideration of major problems, principles, and techniques in determining educational objectives and curriculum content and organization in elementary and secondary schools in the light of modern theory and practice.

[R.E. 277. **Courses of Study in Vocational Agriculture.** Second term. Credit two hours. Associate Professor HOSKINS. Not given in 1942–43.]

[R.E. 278. **Seminar in Rural Secondary Education.** Second term. Credit two hours. Professor FERRISS. Not given in 1942–43.]

HISTORY OF EDUCATION

[Ed. 13. *History of American Education.* First term. Credit three hours. Not given in 1942–43.]

Ed. 16. **Readings in the History of Education.** Second term. Credit two hours. Consent of the instructor is required. Associate Professor HULSE. Hours to be arranged.

An advanced course emphasizing the historic changes in aims and methods.

Educational Theory

R.E. 194. *Principles of Vocational Education.* First term. Credit three hours.

R.E. 281. **Rural Secondary Education.** First term. Credit three hours. Professor Ferriss. M W F 9.

A consideration of some of the more basic problems in the functions, nature, organization, curriculum, and extension of secondary education in its adaptations to rural and village needs and conditions.

R.E. 294a. **The Evolution of Educational Theory.** First term. Credit three hours. Open to graduate students well grounded in the study of education. Professor Eaton. T Th 9, S 10.

The course calls for a study and comparison of the major theories of education from Plato to John Dewey.

R.E. 294b. **Theories of Values in Education.** Second term. Credit two hours. Open to graduate students who have had two years or more of professional experience in education. Professor Eaton. M F 11.

The course calls for study (1) of the nature of educational enterprise, (2) of the major criteria of educational value, and (3) for the valuing of objectives, content, and organization in specific enterprises of education.

[R.E. 295. **Comparative Education.** First term. Credit two hours. Professors Butterworth, Ferriss, and Moore. Not given in 1942–43.]

Nature Study

R.E. 106. *Outdoor Living.* First term. Credit two hours.

R.E. 107a. *The Teaching of Nature Study and Elementary School Science.* Second term. Credit two hours.

R.E. 108. *Field Natural History.* Second term. Credit two hours.

R.E. 202. **Nature Literature.** First term. Credit two hours. Open to seniors and graduate students interested in science and science teaching. Professor Palmer and Miss Gordon. M 1:40–4.

A survey of nature and science prose, poetry, and fiction with some attention to their significance at elementary and secondary school levels.

[R.E. 209. **The Nature Movement and Its Makers.** First term. Credit two hours. Professor Palmer and Miss Gordon. Not given in 1942–43.]

Research

B 300. **Special Studies.** Credit as arranged. Members of the staff.

Students working on theses or other research projects may register for this course. The staff members concerned must be consulted before registration.

THE ENGINEERING DIVISION

S. C. HOLLISTER, *Chairman.* W. R. CORNELL, *Secretary.*

THE ENGINEERING DIVISION of the Graduate School consists of all professors, associate professors, and assistant professors of the College of Engineering, the Dean of the Graduate School, and such other members of the Faculty of the University as have supervision of the work of Graduate Students in the Division.

THE EXECUTIVE COMMITTEE of this Division has general supervision of the graduate work falling within it jurisdiction, and its chairman and secretary are the same as for the Division.

Each of the main branches (Chem.E., C.E., E.E., and M.E.) of the Division has a COMMITTEE ON GRADUATE WORK which has direct charge of the following: examining engineering credentials of applicants for admission, which, however, must first be sent to the Dean of the Graduate School; corresponding with applicants for the purpose of giving or receiving information or of giving advice concerning the availability of facilities for the graduate work desired in Engineering; the registration of students in the subdivision, after they have registered in the Graduate School; giving advice and approval regarding the student's program and the selection of his Special Committee, which has direct charge of his work; looking after the completion of undergraduate shortages; and making final review of the student's records to check the fulfillment of all scholastic requirements for the degrees. The membership of the Committees on Graduate Work in the four subdivisions is as follows:

COMMITTEES ON GRADUATE WORK IN THE ENGINEERING DIVISION

CHEMICAL ENGINEERING—F. H. RHODES, *Chairman*, 124 Olin Hall; C. C. WINDING, *Secretary*, Baker Laboratory; C. W. MASON, Baker Laboratory.

CIVIL ENGINEERING—W. L. MALCOLM, *Chairman*, 122 Lincoln Hall; R. Y. THATCHER, *Secretary*, 308 Lincoln Hall; E. W. SCHODER, 206 Lincoln Hall.

ELECTRICAL ENGINEERING—W. A. LEWIS, *Chairman*, 107 Franklin Hall; W. C. BALLARD, JR., *Secretary*, M 125 Franklin Hall; R. F. CHAMBERLAIN, 105 Franklin Hall.

MECHANICAL ENGINEERING—W. N. BARNARD, *Chairman*, 18 West Sibley; W. R. CORNELL, *Secretary*, 304 West Sibley; W. M. SAWDON, Mechanical Laboratory.

DIVISION REPRESENTATIVE on the General Committee of the Graduate School, and Chairman of Group E.—J. N. GOODIER.

GRADUATE STUDY IN ENGINEERING

The instructing staffs and the laboratories, libraries, and other facilities of the various departments of the College of Engineering and those of the other departments of the University are available for students desiring to pursue graduate study and research in engineering and allied fields. Graduate students in engineering will also find among the regular and elective courses given in the College and in mathematics, physics, chemistry, and in other departments of the University, many suitable for advanced study. For the courses offered, and for the laboratory, library, and other facilities in Engineering, see the *Announcement of the College of Engineering.*

ADVANCED DEGREES OFFERED

The degrees of Master of Chemical Engineering (M.Chem.E.), Master of Civil Engineering (M.C.E.), Master of Electrical Engineering (M.E.E.), Master of Mechanical Engineering (M.M.E.), Master of Science in Engineering (M.S. in Engineering), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) are granted in the field of engineering. For the professional degrees, Chem.E., C.E., M.E., and E.E., see the *Announcement of the College of Engineering.*

The Degrees of M.Chem.E., M.C.E., M.E.E., M.M.E., and M.S. in Engineering

Subject to certain general regulations of the Graduate School,[1] the rules governing admission to candidacy for and for graduation with one of the engineering degrees (M.Chem.E., M.C.E., M.E.E., M.M.E., and M.S. in Engineering) are established and administered by the Engineering Division of the Graduate School.

For purposes of administration, the Engineering Division of the Graduate School has created four *Committees on Graduate Work*, one for each of the subdivisions (Chem.E., C.E., E.E., and M.E.). See page 146.

The Degrees of M.S. and Ph.D.

The rules governing admission to candidacy for, and those for graduation with, the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) are established and administered by the Faculty of the Graduate School.[2] For further information concerning these degrees, see pages 14 and 21.

Fellowships and Scholarships

See pages 35 and 38 of this *Announcement.*

ADMISSION TO GRADUATE STUDY IN ENGINEERING

(1) All applications for admission to the Graduate School and all applications for Graduate Fellowships and Scholarships must be sent to the *Office of the Graduate School.* Obtain the necessary blanks and instructions from that office.

(2) If the applicant wishes to become a candidate for one of the advanced Engineering Degrees his credentials should include not only information requested on page 12, but in addition, (a) a statement showing, if possible, his relative standing in his class, (b) a catalogue of the institution from which he graduated, with each subject that he has completed clearly marked therein, and (c) a detailed statement concerning his practical experience, together with letters from his employers.

(3) In all cases, the applicant should designate as definitely as possible his chosen fields of study, both major and minor, so that he may be advised concerning the facilities and personnel available in those fields. See paragraphs 13 and 19 below.

(4) A prospective graduate student is urged to write to the office concerned (Chemical, Civil, Electrical, or Mechanical Engineering) for advice or information.

(5) Candidacy for M.Chem.E., M.C.E., M.E.E., or M.M.E., presupposes the substantial equivalent of the corresponding first degree at Cornell University. In the evaluation of a candidate's credits, however, the quality of his previous work, his practical experience if any, and his chosen fields of advanced study will be considered in making adjustments if the candidate's undergraduate work has not been the exact equivalent of that required for the corresponding undergraduate degree at Cornell.

Candidacy for the degree M.S. in Engineering presupposes graduation from a school or college of recognized standing, with work, either prior to or subsequent to the bachelor's degree, which is equivalent to a recognized curriculum in engineering and which is adequate preparation for the field chosen for graduate work.

(6) A shortage, which does not exceed six university credit hours, may be made up as extra work. If an applicant's total shortage is more than six hours, he may be required, and if more than eighteen hours he will be required, to enter an undergraduate school, and pay the undergraduate fees. See paragraph 12 below.

(7) The Committees on Graduate Work will recommend for admission to the Graduate School only those applicants who show promise of outstanding ability to pursue graduate study and research, judged by previous record and training.

---

[1] See page 12.

[2] Although not under the supervision of the Engineering Division, it is to the advantage of candidates for non-professional degrees in Engineering who have registered in the Graduate School to register also in the appropriate branch of the Engineering Division.

No applicant will be admitted to the Graduate School for work in Engineering unless he is in at least the upper half of his class. Exception may be made when an applicant can present further evidence which would demonstrate his fitness to carry on graduate work.

(8) When a student's Special Committee considers that a reading knowledge of French or German or both is essential for satisfactory progress in his particular fields of study, the student will be required to demonstrate such knowledge before proceeding with this study.

(9) An applicant who does not care to meet the requirements either for entrance to candidacy for or graduation with an advanced degree may arrange for a program of work as a "non-candidate," provided only that he has had previous training which is adequate for advanced study in the fields of engineering in which he desires to work.

(10) A student whose mother tongue is other than English may be required by the Committee on Graduate Work to furnish satisfactory evidence of his ability to speak, write, and read English to a degree sufficient for satisfactory progress in his graduate work. The Committee may lengthen the minimum time of residence and prescribe some study of English when a student's deficiency in this respect is deemed to place an undue burden upon him and upon the faculty members with whom he is to come in contact.

Registration

A graduate student in engineering must, at the beginning of each term of residence, register first in the Graduate School and then at the office of the Engineering School of whose faculty his major professor is a member.

RULES GOVERNING GRADUATE STUDY LEADING TO MASTERS' DEGREES IN ENGINEERING

(11) A Master's Degree in engineering shall be awarded only after the candidate has spent at least one full academic year, or the equivalent, in residence and study at the University.

(12) In general, a graduate student should remove his shortages before he enters his chosen fields of graduate work. Since it is not always practicable to do this, the student may receive permission from the Committee on Graduate Work to make up his shortages while doing his graduate work.

Arrangements can sometimes be made for making up deficiencies in the Summer Session preceding admission to the Graduate School. Sometimes graduate work may also be done in the summer, either in the Summer Session or by special arrangement under "personal direction." To be allowed to work under "personal direction," a student is expected to have spent one year in graduate study, here or elsewhere.

In making up shortages, a student is under the general supervision of the Committee on Graduate Work.

(13) (a) A student shall select a major field of study to which he shall devote not less than one-half nor more than three-fourths of his time. He must also select one or more secondary fields of study to which he shall devote the remainder of his time.

(b) A student shall select one Professor[1] who shall supervise his work in his major field. For each secondary (or minor) field to which he intends to devote not less than one-fourth of his time, he shall select one Professor to supervise his work in that field. The Professor or Professors thus selected shall be known as his *Special Committee*. The Professor in charge of the major field shall be Chairman of the Special Committee. If the student selects a secondary field to which he intends to devote less than one-fourth of his time, he shall in that field be under the supervision of the Committee on Graduate Work.

(14) A student shall select his program of study and his Special Committee

[1]Members of the Faculty who are qualified to supervise the work of graduate students are Professors, Associate Professors, Assistant Professors, and those Instructors who hold the doctor's degree. For the sake of brevity any such member is herein referred to as "Professor."

with the advice and approval of the Committee on Graduate Work in that subdivision (Chem.E., C.E., E.E., or M.E.) in which his major subject falls. No change in the program of study or in the personnel of the Special Committee shall be made without the written approval of the appropriate Committee on Graduate Work and the advice of the student's Special Committee.

(15) When a candidate for an advanced degree in Engineering takes a course specified by the Committee on Graduate Work or approved by his Special Committee, he must register in that course and must conform to all the requirements of that course, including the examinations.

(16) If, in the opinion of the Special Committee, a candidate at any time during his residence shows insufficient preparation in any subject or subjects, he may be required to register in and take the work of specified undergraduate courses. His residence requirement will be increased accordingly.

(17) A candidate for a master's degree in Engineering must present a *thesis* on a subject in his major field. The thesis must show initiative and originality and must conform to the general requirements of the Graduate School. It may take one of the following forms:

(a) An analytical or interpretative discussion of results already in existence.

(b) A design or construction or both, of sufficient importance and originality to demonstrate thoroughly a knowledge of the principles involved and of their applications.

(c) A dissertation based upon his own original investigation, analytical or experimental.

(18) When a student has satisfied all the requirements set by his Special Committee, including a satisfactory final examination, the Special Committee will so certify to the Committee on Graduate Work. The Committee on Graduate Work will than review the student's record and if the student has fulfilled all scholastic requirements imposed upon him, he will be duly recommended for his degree.

FIELDS OF GRADUATE INSTRUCTION IN ENGINEERING

(19) A candidate for the Master's degree (M.Chem.E., M.C.E., M.E.E., M.M.E., or M.S. in Engineering) must select his major field in Engineering. He will be allowed considerable latitude in the selection of his minor field or fields, and any field may be chosen which includes a sufficient amount of graduate work, and provided his entire program shows a unified purpose. For instance, a student might select some phase of structural engineering as his major field and economics as his minor field if he could show that his study of economics had a definite purpose consistent with a well-rounded training as an engineer. The major and minor fields available in the College of Engineering are listed below. Graduate courses in engineering are described in the following pages. For opportunities in other fields of graduate study, see elsewhere in this *Announcement.*

Approved Major and Minor Subjects[1] (key to symbols on p. 41)

In Chemical Engineering

Chemical Engineering 1, 2, 4

(Candidates for the degree of Master of Chemical Engineering will be expected to be thoroughly familiar with the general field of Chemical Engineering. Candidates for this degree will be required to select a minor in some other field of engineering or in a related science.)

In Civil Engineering

Astronomy
  Geodetic Astronomy 2, 3, 4
  Geodesy 1, 2, 3, 4
Highway Engineering 1, 2, 3, 4
Hydraulic Engineering 1, 2, 3, 4

[1]Any of the basic sciences are also available as minors.

Hydraulics
  Theoretical 1, 2, 3, 4
  Experimental 1, 2, 3, 4
Management Engineering 1, 2, 3, 4
Materials of Engineering 2, 3, 4
Mechanics 1, 2, 3, 4
Railroad Engineering
  Railroad Maintenance 1, 2, 3, 4
  Railroad Location 1, 2, 3, 4
  Railroad Operation and Management 1, 2, 3, 4
Sanitary Engineering 1, 2, 3, 4
  Sewage Treatment 2, 3, 4
  Water Purification 2, 3, 4
Soil Mechanics 1, 2, 3, 4
Structural Engineering
  Structural Engineering 1, 2, 3, 4
  Theory of Structures 1, 2, 3, 4
Surveying
  Geodetic Engineering 1, 2, 3, 4
  Topographic Engineering 1, 2, 3, 4

In Electrical Engineering

Electrical Communication 1, 2, 3, 4
Electrical Conduction through Gases 1, 2, 3, 4
Electrical Design 1, 2, 3, 4
Electrical Machinery 1, 2, 3, 4
Electrical Measurements 1, 2, 3, 4
Electric Circuit Analysis 1, 2, 3, 4
Electric Power Applications 1, 2, 3, 4
Electric Power Generation, Transmission, and Distribution 1, 2, 3, 4
High Voltage Technique 1, 2, 3, 4
Materials of Engineering (in Electrical Engineering) 1, 2, 3, 4

In Mechanical Engineering

Administrative Engineering
  Industrial Accounting 2, 3, 4
  Industrial Marketing 1, 2, 3, 4
  Industrial Statistics 3, 4
Aeronautical Engineering 2, 4
Automotive Engineering 1, 2, 4
Experimental Mechanical Engineering 1, 2, 3, 4
Fluid Mechanics 1, 2, 3, 4
Heat-Power Engineering 1, 2, 3, 4
Industrial Engineering 1, 2, 3, 4
Machine Design 1, 2, 3, 4
Materials of Engineering 1, 2, 3, 4
Mechanical Processing 1, 2, 3, 4
Mechanics 1, 2, 3, 4
Metallography 1, 2, 4

ADMINISTRATIVE ENGINEERING

Professors J. R. BANGS, S. S. GARRETT, G. R. HANSELMAN, and H. J. LOBERG.

3A21. *Economic Organization.* Either term. Credit three hours.

3A23. *Business and Industrial Management.* Either term. Credit four hours.

3A31. *Principles of Industrial Accounting and Cost Finding.* Either term. Credit three hours.

3A34. *Corporation Finance.* Either term. Credit three hours.

3A35. *Industrial Organization and Management.* Either term. Credit three hours.

3A41. *Elementary Industrial Statistics.* Either term. Credit three hours.
3A42. *Personnel Management in Industry.* First term. Credit two hours.
3A43. *Engineering Business Law.* First term. Credit three hours.
3A44. *Industrial Marketing.* First term. Credit three hours.
3A45. *Industrial Marketing.* Second term. Credit two hours.
3A46. *Engineering Business Law.* Second term. Credit two hours.
3A47. *Principles of Cost Control.* Second term. Credit three hours.
3A48. *Business and Industrial Problems.* Second term. Credit two hours.
3A49. *Industrial Relations.* First term. Credit two hours.

3A51. **Business and Industrial Research.** Either or both terms. Credit one hour for each forty hours of actual work. Professor BANGS and others. Open to a very limited number of seniors and graduate students who have shown by training and aptitude their ability to carry on original investigations in business and industrial subjects.

3A52. *Industrial Salesmanship.* Second term. Credit two hours.
3A54. *Standard Costs and Management Control.* First term. Credit three hours.

NOTE:—Only a limited number of graduate students can be taken in this department. Those contemplating graduate work in Administrative Engineering are advised to make advance arrangements with the department.

AERONAUTICAL ENGINEERING

Professors G. B. UPTON and C. W. TERRY.

Problems related to the design and performance of airplanes may be carried on in this field. The laboratories of the department of Experimental Engineering are available for studies on airplane engines. Arrangements may be made with the authorities of the Ithaca airport for flight experiments. Most of the technical reports and notes of the National Advisory Committee for Aeronautics and the Aeronautical Research Committee are available in the library.

3B35. **Aerodynamics.** Second term. Credit two hours. Prerequisites, courses 3M21 and 3M22a and b. Two recitations a week. Assistant Professor TERRY.

Properties of air, airfoil characteristics, drag calculations, engine-propeller characteristics and their relation to airplane performance. Stability calculations, performance estimates, and flight testing.

3B46. **Airplane Design.** First term. Credit two hours. Prerequisite, 3B35. Two recitations a week. Assistant Professor TERRY.

Layout procedure, weight and balance estimates, load factors, materials, and costs. Principles of stress analysis and airplane computations.

3B47, 3B48. **Airplane Computations.** Throughout the year. Credit two hours a term. Prerequisite, course 3B35; and must be accompanied or preceded by 3B46. Two computing periods a week. The student makes calculations and drawings similar to those required by the Department of Commerce for approval of the design of an airplane. Assistant Professor TERRY.

AGRICULTURAL ENGINEERING

See under AGRICULTURE, p. 127.

AUTOMOTIVE ENGINEERING

Professors G. B. UPTON, V. R. GAGE, and ————.

Special problems relating to Automotive Engineering may be selected for advanced study. Laboratory facilities of the Department of Experimental Engineering are available for research on internal combustion engines, or on the chassis dynamometer; and arrangements may be made for investigations on other automotive topics. Students desiring to take a minor in this field may find courses 3B41, 42, 43 and 44 suitable as a foundation.

3B41, 3B43. **Automotive Design.** First term. Professor UPTON. Two lectures and two computing periods a week.

General study of automotive road vehicles and their functioning; driving, braking, steering, springing, power required for operation.

3B42, 3B44. **Automotive Design.** Second term. Professor UPTON. Two lectures and two computing periods a week.

Power plants of automotive field, particularly internal combustion types. General design and functioning, lubrication, mechanical efficiency, volumetric efficiency, valving, balancing, carburation, ignition, performance.

3B50. **Advanced Automotive Engineering.** Either term. Credit two to five hours as arranged. Professor UPTON and Assistant Professor TERRY.

Selected advanced topics and special problems as arranged.

CHEMICAL ENGINEERING

Professors F. H. RHODES, C. W. MASON, O. J. SWENSON, A. W. LAUBENGAYER, C. C. WINDING; *Doctor* E. H. TAYLOR.

To qualify for admission as a candidate for the degree of M.Chem.E., a student must hold the degree of B.Chem.E., or the equivalent thereof, and must have completed satisfactorily a course substantially equivalent to the course leading to the degree of B.Chem.E. at Cornell University.

The work for the thesis may be in the specific fields of:

Unit Operations.

Unit Processes.

Chemical Engineering Economics.

Chemical Plant Design.

701. *Chemical Engineering Technology.* Throughout the year. Credit two hours a term.

705. *Unit Operations of Chemical Engineering.* Throughout the year. Credit three hours a term.

710. *Unit Operations of Chemical Engineering.* Laboratory. Throughout the year. Credit two hours a term. One lecture and one laboratory a week.

715. **Unit Processes of Chemical Engineering.** Second term. Credit three hours. Prerequisite or parallel course, Chemical Engineering 705. Assistant Professor WINDING. M W F 11. Baker 177.

Lectures. A discussion of the important typical unit processes of chemical engineering, as, for example, nitration, sulphonation, esterification, caustic fusion, chlorination, etc.

725. **The Chemistry of Fuels.** First term. Credit three hours. Prerequisite, or parallel course, Chemical Engineering 705. Assistant Professor WINDING. M W F 11. Baker 177.

Lectures. The chemistry of coal, coke, petroleum, tars, and the fuel gases. Particular stress is laid upon the theoretical chemistry involved in the carbonization of coal, the gasification of coal, and the distillation and refining of petroleum and tar.

730. **Chemical Plant Design.** Throughout the year. Credit three hours a term. Prerequisite, Chemical Engineering 705. Professor RHODES, Assistant Professors SWENSON and WINDING, and Dr. TAYLOR. Day and hour to be arranged. Breakage deposit, $10.

One conference and two laboratory periods. Practice in the calculation and design of chemical plant equipment.

735. **Plant Inspections.** Second term. Credit one hour. Prerequisite or parallel course. Chemical Engineering 705.

Visits to plants typical of various chemical industries. A trip during spring vacation will be a feature of this course. Fee, covering expenses, to be announced.

740. **Chemical Engineering Computations.** Throughout the year. Credit two hours. Assistant Professor WINDING.

DESCRIPTIVE GEOMETRY AND DRAWING

(In Civil Engineering)

Professor H. T. JENKINS.

202. *Drawing.* Sophomore. First term. Credit one hour.

203. *Drawing.* Sophomore. Second term. Credit two hours.

204. *Descriptive Geometry.* Sophomore. First term. Credit three hours.

205. **Advanced Drawing.** Second term. Credit three hours. Assistant Professor JENKINS.

Perspective drawings, rendered in pencil, ink, and washes, of buildings, concrete bridges, dams, and other engineering works; building details of window frames, doors, stairs, and other simple units, to give the student some insight into detailing parts of plans, and further to familiarize him with reading working drawings. Problems in concrete, structural, topographical, highway, and sanitary drafting; engineering drawings, rendered in color, to enable the student to supplement ordinary working drawings with artistic representations so portrayed as to be readily intelligible to non-technical persons.

(In Mechanical Engineering)

Professors C. E. TOWNSEND and S. F. CLEARY.

3C10. *Drawing and Descriptive Geometry.* First term. Credit three hours.

3C11. *Mechanical Drafting.* Second term. Credit three hours.

3C15 a and b. *Drawing.* Throughout the year. Credit two hours a term.

TOPICS SUGGESTED FOR ADVANCED WORK

Special Applications of Descriptive Geometry.

Economic Organization of Geometric Structures.

Drafting Tools and Equipment.

ELECTRICAL ENGINEERING

Professors W. A. LEWIS, W. C. BALLARD, R. F. CHAMBERLAIN, R. W. AGER, L. A. BURCKMYER, M. G. MALTI, E. M. STRONG, B. K. NORTHROP, TRUE MCLEAN, M. G. NORTHROP, W. W. COTNER, and W. E. MESERVE. *Doctors* H. SOHON, H. G. SMITH, A. B. CREDLE, and J. G. HUTTON.

RESEARCH: Research in Electrical Engineering may be divided into two general classes (a) theoretical and (b) experimental. Whenever possible the student is required to prove his theoretical deductions by experiment and conversely he is required to explain his experimental results by theoretical considerations.

For theoretical research the facilities of a well-equipped library are available.

For experimental research special equipment and shop facilities are required. The College of Engineering maintains several mechanics and has machine shops fully equipped to provide shop facilities. The available special equipment required for experimental work along specific lines is given under the general topics outlined below.

GRADUATE COURSES AND TOPICS: Members of the faculty are prepared to guide students in the *graduate topics* given below. Seminars are conducted by members of the faculty for groups of graduate students interested in closely related lines of research.

ELECTRICAL COMMUNICATION

450. *Electronics.* Second term. Credit four hours.

451. **Electrical Communication Engineering.** First term. Credit three hours. Prerequisites, 411, 412, 431, 450. Professor BALLARD and Assistant Professor MCLEAN.

Theory of alternating currents as applied to telegraph, telephone, and radio communication. Theory and application of thermionic devices.

452. **Electrical Communication Engineering.** Second term. Credit four hours. Prerequisite, 451. Professor BALLARD and Assistant Professor MCLEAN.

Consideration of problems, apparatus, and measurements particularly applicable to electrical communication engineering.

453–454. **Theory of Communication Networks.** Throughout the year. Credit two hours a term. Must be accompanied or preceded by 451. Assistant Professor MCLEAN.

Foundation laws of elements and circuits with variable frequency. General network theorems. Two and four terminal structures. Recurrent networks and wave filters. Equalizers. Distributed circuits including continuous and concentrated loading of long lines. Special networks for very high frequencies.

456. **Elements of Broadcast Engineering.** Second term. Credit two hours. Prerequisite, 451. Must be accompanied by 452. Professor BALLARD.

Critical analysis and design of equipment used for radio telephone transmission. The laws of acoustics as applied to studio construction and equipment.

4C53, 4C54. **Ultra High Frequency Techniques.** Throughout the year. Two lecture-recitations, one laboratory period a week. Prerequisite, Course 450. Professors BALLARD and MCLEAN, Doctors H. G. SMITH and CREDLE.

A study of the theory and techniques of ultra-high frequency equipment. The course will include both theoretical consideration and laboratory testing of various types of high frequency oscillators including triodes, magnetrons, klystrons and other similar tubes; transmission lines including parallel wire and concentric types; wave guides; radiating systems including antenna arrays, electro-magnetic horns, paraboloids, and other directive systems; receivers for ultra high frequency waves; pulse circuits, and cathode ray oscillographs.

Maxwell's field equations and their application in the theory of ultra high frequency propagation and radiation will be considered in some detail.

Graduate Topics. Electro-mechanical vibrating systems, propagation of electromagnetic waves, thermionic tubes and their applications, design of radio circuits, sound recording and reproduction, electric wave filters, carrier current telephony.

SPECIAL EQUIPMENT. Broadcast transmitter, 1 Kw., complete and up to date in separate building with antenna towers. Complete studio and control equipment. Available to advanced students for special problems. Primary frequency standard, consisting of 100 k.c. temperature controlled quartz crystal oscillator with multivibrator and harmonic amplifier. Laboratory is equipped with 2.5 Kw., 2,000 volt, D.C. power supply and large assortment of power tubes and parts for experimental work on radio transmitters.

Complete type D carrier current telephone equipment, with signalling auxiliaries.

Audible and carrier frequency oscillator, with complete set of resistance, inductance, and capacitance standards for impedance bridge measurements.

Vacuum tube voltmeter-milliammeter and transmission measuring set.

Complete laboratory model 100 line step-by-step dial telephone exchange.

Large assortment of small meters and equipment for studying characteristics of receiving tubes, audio transformers, and telephone equipment.

Standard Signal Generator and wave analyzer.

Complete equipment for the manufacture and exhaustion of experimental electron tubes, both of high vacuum and vapor types, is available for the construction of special apparatus.

ELECTRICAL MACHINERY AND ELECTRICAL DESIGN

413. *Direct Current Machinery.* First term. Credit two hours.

412. *Elements of Electrical Engineering.* Second term. Credit four hours.

431, 432. *Electrical Laboratory.* Throughout the year. Credit three hours first term, two hours second term.

450. *Electronics.* Second term. Credit four hours.

421. **Electrical Practice.** First term. Credit three hours. Three lecture-recitations each week. Prerequisites, 411, 412, 413, 431, 432. Associate Professor AGER.

Practical aspects of advanced electrical theory, as applied to rotating electric machinery.

442. **Electrical Design.** Second term. Credit four hours. Prerequisites, 421 and 433. Assistant Professor M. G. NORTHROP.

Fundamental principles underlying the design of direct and alternating current machinery.

433–434. **Advanced Electrical Laboratory.** Throughout the year. Credit four hours a term. Prerequisites, 412, 413, 431, 432, and 450. Associate Professor BURCKMYER. Two recitations and one laboratory period each week.

Laboratory technique and instrumentation. Tests on rotating machinery, transformers, and other apparatus.

Theory and Characteristics of Electrical Machinery. Prerequisite, general knowledge of the theory and testing of electrical machinery.

Advanced theory of electric and magnetic circuits. Mathematical treatment of the physical laws involved in the performance of continuous and alternating current machines. Transient behavior of high-voltage apparatus. Relationship between proportions and operating characteristics. The theory underlying special tests for the determination of machine constants.

Graduate Topics. Advanced study of the parameters of revolving machines, special design problems, transient analysis of machines, hunting and stability problems, short circuit phenomena, commutation, armature reaction.

SPECIAL EQUIPMENT. A great variety of direct and alternating current machines is available, so selected as to afford at least one machine of every type ordinarily encountered in practice. Most of these represent modern construction and are of such size and design as to give typical performance, but at the same time provision is made for great flexibility of operation. One 15-kva. synchronous machine is provided with a phase-wound rotor and a squirrel-cage rotor, either of which may be readily used to replace the synchronous rotor. A modern type of synchronous converter is arranged for direct or inverted operation, either single-phase, two-phase, or three-phase, with metering and control boards which permit very rapid change of operating conditions. There are three types of commutating alternating-current motors, four types of fractional-horsepower alternating-current motors, and a large number of direct-current machines.

Typical examples of automatic starters for alternating and direct current motors are provided, including time-element, counter-e.m.f., and series lockout types, as well as drum controllers.

The non-rotating apparatus also includes constant-potential transformers of standard and special construction, constant-current transformers, induction regulators, storage batteries, and a small mercury-arc rectifier.

The electronic laboratory contains various types of high vacuum thermionic devices, gas conduction devices, photo-electric cells, mercury tubes, and a modern 6-phase steel-tank mercury rectifier with grid control and complete vacuum apparatus, so arranged that it may be operated either as converter or inverter.

The facilities for testing are well-planned and very complete. For machine testing, there are numerous Prony brakes, an electric dynamometer, and a special apparatus for determining the complete characteristics of fractional-horsepower motors.

ELECTRICAL MEASUREMENTS

431. *Electrical Laboratory.* First term. Credit three hours.

433–4. **Advanced Electrical Laboratory.** See above.

Graduate Topics. Design of special types of meters and the characteristics of the exponential response meter, development of methods of measurement, characteristics of measuring instruments.

SPECIAL EQUIPMENT. The Standardizing Laboratory includes standard precision ammeters and voltmeters. A Silsbee current-transformer test set, and primary standards of voltage and resistance with the necessary potentiometers and auxiliary equipment arranged for convenient checking of secondary standards and of other meters.

Electric Circuit Analysis

410. *Elements of Electrical Engineering.* Second term. Credit four hours.
411. *Elements of Electrical Engineering.* First term. Credit three hours.

423–424. **Advanced Electrical Theory.** Throughout the year. Credit two hours a term. Two recitations each week. Associate Professor Malti.

The work of the first term covers dimensional analysis, circuits with variable characteristics, coupled circuits, non-sinusoidal currents, and Fourier Series.

The second term is devoted to balanced and unbalanced polyphase circuits, symmetrical components, electric transients, filter circuits, and ladder networks.

485–486. **Heaviside's Operational Analysis.** Throughout the year. Prerequisite, 411 or its equivalent. Concurrently with or preceded by 423 and 424. Credit three hours a term. Associate Professor Malti. Two lecture-recitations and one computing period a week.

Mathematical introduction covering functions of real variables, functions of complex variables, infinite series, some special functions, integral equations, and Laplace and Fourier transforms. Generalized expansion theorems for differential and difference equations. Application to transient problems in circuits with lumped and distributed parameters, and to ladder networks.

Network Analysis and Synthesis. Throughout the year. Prerequisites, 423 and 424. Associate Professor Malti.

Two-terminal networks, three-terminal networks, *n*-terminal networks. General network theorems. Transducers and their combinations, filters, network synthesis, non-linear circuits, and varying parameter circuits.

Seminar in Circuit Analysis. Throughout the year. One period of two hours each week. Prerequisites, a general knowledge of Circuit Analysis and of the principles of electric machines. Associate Professor Malti.

This seminar reviews the developments in the fields of circuit analysis and electrical machinery and provides opportunity to discuss the research work of graduate students in these fields.

Graduate Topics: General theory of circuits and networks, skin effect, eddy currents in metallic masses, transient phenomena, electro-magnetic oscillations and waves, electric wave filters.

Electric Power Applications

462. **Industrial Application and Control of Electricity.** First term. Credit two hours. Prerequisites, 412 and 432. Professor Chamberlain.

Study and selection of motor drives and control, electric welding, and electric heating.

465–466. *Illumination.* Throughout the year. Credit two hours a term.

Electric Power Generation, Transmission, and Distribution

422. **Electrical Practice.** Second term. Credit three hours. Three lecture-recitation periods each week. Prerequisites, 411, 412, 431, 432. Associate Professor Ager and others.

The application of advanced electrical theory to problems in high voltage phenomena, dielectrics, corona, transmission circuits, and lightning protection.

441. **Electric Power Plant Design.** Second term. Credit three hours. Prerequisites, 411 and 412. Professor Lewis.

Selection and arrangement of power plant equipment. Operating features, public policy, and finance.

463. **Electrical Power Transmission and Distribution.** First term. Credit three hours. Must be accompanied by 421–423 and 433. Professor Lewis and Assistant Professor M. G. Northrop.

Principles of electric power transmission and distribution. Long lines with distributed parameters. Circle diagrams. Elements of power system stability.

444. **The Economics of Public Utilities.** Second term. Credit three hours. Professor CHAMBERLAIN.

A study of the origin and development of public utilities, regulation, rates and rate structures, and public relations.

4P64. **Stability of Electric Power Systems.** Second term. Credit two hours. Prerequisites, 421, 423, 433, 463. Professor LEWIS.

The method of symmetrical components, positive, negative, and zero-sequence, impedance of stationary apparatus and revolving machines; theoretical and experimental determination of such impedances. Static and dynamic stability of simple and complex electrical systems; methods of computation. Means for increasing stability.

Graduate Topics. Circuit breaker and reactor problems. System disturbances, lightning protection, relay protection, system stability, voltage regulation, corona. Sag stress in transmission lines, insulator stresses, Valuations, rate structures, accounting methods, rate of return, public ownership, holding companies, depreciation, public regulation, capitalization.

HIGH VOLTAGE TECHNIQUE

422. **Electrical Practice.** Second term. Credit three hours. See page 156.

High Voltage Practice. Throughout the year. Prerequisites, 422. Associate Professor AGER.

Insulation tests of apparatus and insulators. Low-frequency and impulse tests, wet and dry. Corona measurements. Radio influence.

Graduate Topics. Behavior of insulating materials under electrical stress. Dielectric strength of solid, liquid and gaseous insulating materials. Partial and complete breakdown and corona. Lightning studies with models.

SPECIAL EQUIPMENT. The new high voltage research laboratory offers unexcelled experimental facilities for research in this field. Equipment includes a three-unit, 60-cycle testing transformer bank that may be connected cascade to provide 750,000 volts, single phase, or wye to provide 433,000 volts, three phase; a 3,000,000 volt impulse generator; radio-influence measuring equipment; and a high-voltage cathode-ray oscillograph. An outdoor transmission line adjacent to the laboratory permits study of corona and behavior of surges under simulated service conditions.

MATERIALS OF ELECTRICAL ENGINEERING

Solid Dielectrics. Throughout the year. Prerequisites, 421–2–3–4. Associate Professor MALTI.

A study of anomalous behavior of solid dielectrics under varying conditions of e.m.f., time, frequency, temperature, pressure, humidity, and ionizing radiation.

Magnetic Materials. Throughout the year. Prerequisites, 421–2–3–4. Associate Professor MALTI.

A study of the properties of magnetic materials such as hysteresis, permeability, the effect of crystal structure and heat treatment on the magnetic properties of materials and magnetic analysis (i.e. the correlation of magnetic and mechanical properties).

Electrical Testing. Prerequisites, 421–2–3–4 and 433–434. Associate Professor BURCKMYER.

The testing of engineering materials for determining their magnetic and electrical properties.

SPECIAL EQUIPMENT. The magnetic testing apparatus includes a Fahy permeameter, an Epstein apparatus and a large motor-generator set comprising two sine-wave generators and a third-harmonic generator on the same shaft, with provision for adjusting phase displacement and for measuring form factor. The dielectric testing apparatus includes an 80,000-volt testing transformer together with full-wave rectifying equipment and an electrostatic voltmeter. Among the general pieces of test equipment are a complete assortment of meters

and oscillographs. For the study of discharge of electricity through gas a vacuum system is available, and specially designed tubes to show special discharge phenomena.

EXPERIMENTAL MECHANICAL ENGINEERING

Professors V. R. GAGE, W. C. ANDRAE, J. O. JEFFREY, and J. R. MOYNIHAN.

Numerous laboratories and shops are available for carrying on the many activities in Experimental Mechanical Engineering. See the *Announcement of the College of Engineering.*

Students contemplating experimental research should communicate with the department as far as possible in advance of beginning work in order to arrange for the use of available equipment.

3X32. *Introductory Experimental Engineering.* Second term. One laboratory period a week and a written report of the work.

3X41, 3X42. *Experimental Engineering.* Throughout the year. One laboratory period a week and a written report of the work.

3X43. *Experimental Engineering.* First term. Selected experiments from 3X41.

3X51. **Experimental Engineering Research.** Either or both terms. Prerequisites dependent upon field of investigation selected. Professors GAGE, JEFFREY, and MOYNIHAN.

Open to a limited number of seniors and graduates who have available at least two laboratory periods a week and who have shown proficiency in engineering subjects. Special problems and investigations which are in general carried on in the laboratories under the immediate direction of the members of this department, but which may be carried on in any department of engineering under the general supervision of this department. The work done may be reported upon in a thesis.

3X53. **Temperature Measuring Instruments.** Either term. Credit two hours. Prerequisites, 3X32 or 3X34. Dr. DROPKIN.

Theory, construction, calibration, and application of: liquid-in-glass thermometers, solid expansion thermometers, pressure-spring thermometers, electrical resistance thermometers, thermocouples, optical pyrometers, and radiation pyrometers.

TOPICS SUGGESTED FOR ADVANCED WORK

Instrumentation
Heat Transfer
Heating and Ventilation
Refrigeration
Air Conditioning
Flow of Fluids
Fuels
Power Transmission
Insulating Materials
Engineering Materials
Physical Metallurgy
Applied Metallography
Internal Combustion Engines
Lubrication

HEAT-POWER ENGINEERING

Professors F. O. ELLENWOOD, R. E. CLARK, W. H. HOOK, and C. O. MACKEY.

In each of the many branches of this very extensive field are innumerable opportunities for making advanced studies of interest and value. This advanced work includes such studies as original investigations in engineering thermodynamics; interpretative studies of available data and other material; investigations in power plant economics; the design, selection, and arrangement of apparatus, and plant layout, to meet specific requirements; analytical and experimental research; to mention but a few of the possibilities. The department and college libraries are liberally provided with reference books, periodicals, transactions of engineering societies, reports, and other material related to this field.

As prerequisite for this graduate work the student should have had the equivalent of the fundamental courses in heat-power engineering that are required of undergraduates in mechanical engineering at Cornell. These courses are described

in the *Announcement of the College of Engineering*. Those lacking the full equivalent of this training may be required to take one or more of these undergraduate courses or to do specially assigned work to make up the deficiency.

The following courses, which are described in the *Announcement of the College of Engineering*, are open to both undergraduate and graduate students:

3P31, 3P32. *Heat-Power Engineering*. Throughout the year. Three hours a week.

3P41, 3P42. *Heat-Power Engineering*. Throughout the year. Three hours a week.

3P43A. *Heat-Power Engineering*. Second term. Three hours a week. Two lectures and one laboratory period a week.

3P44, 3P45. **Steam and Oil-Engine Plants.** Throughout the year. Two hours a week. Prerequisites, 3D31, 3D32, 3D33, 3P31 and 3P32 and must be accompanied or preceded by 3P41 and 3P42. Mr. WRIGHT.

Performance characteristics and design features of steam and internal-combustion prime movers, steam generators, condensers, feedwater heaters, evaporators, deaerators, oil engines, pumps, fans, and cooling towers; power-plant piping; automatic control; power plant instruments, fuel-burning equipment; coal-and-ash-handling equipment.

3P46, 3P47. **Power Plant Computing and Design.** Throughout the year. Must be accompanied by 3P44 and 3P45. Two computing periods a week. Mr. WRIGHT.

3P48. **Heating, Ventilating, and Air Conditioning.** Either term. Credit three hours. Prerequisite, course 3P32. Professor MACKEY.

Principles and practice in the conditioning of air, including cooling, heating, dehumidifying, humidifying, and ventilating.

3P49. **Refrigeration.** First term. Two hours a week. Prerequisite, 3P32 or 3P34. Professor ELLENWOOD.

General principles, applications, and economic and commercial factors involved in various forms of modern refrigeration as applied to both domestic and industrial installations, including those pertaining to air conditioning.

3P50. **Power Plant Economics; Equipment Selection.** First term. Two hours a week. Prerequisite, 3P32 or 3P34. Mr. WRIGHT.

Costs of equipment and plants; energy costs; load curves, station factors; determining characteristics of equipment; selection of best working pressures, temperatures, and cycles; economic number and size of units. Selection of equipment based on these and other determining considerations. Economic operation. Applications to central stations and to industrial power and heating plants. By-product power. Other similar topics.

3P51. **Steam Turbines.** Second term. Two hours a week. Prerequisite, 3P32 or 3P34. Assistant Professor CLARK.

Classification of turbines and description of leading features of the various types; mechanical and thermal considerations underlying the action of steam in turbines; calculations involved in turbine design; discussion of building, erecting, and testing; adaptability to special conditions of service; economic results of the use of turbines in engineering practice.

3P52. **Internal Combustion Engines.** First term. Two hours a week. Prerequisites, 3D31, 3D32, 3D33, and 3P32 or 3P34. Assistant Professor CLARK.

Fuels; general theory and salient points in the design and operation of internal combustion engines; study of existing commercial types, relative advantages, and questions of economy; current developments.

3P53. **Steam Boilers and Related Apparatus.** First term. Two hours a week. Prerequisites, 3D31, 3D32, 3D33, and 3P32 or 3P34. Associate Professor HOOK.

Fuels, combustion, combustion apparatus; furnaces and boiler types, proportions, materials, design of details; superheaters, economizers, air heaters; accessories; equipment, arrangement, and operation of steam generating plants.

3P55. **Graphical Computations and Representations.** Second term. Two hours a week. Professor MACKEY and Assistant Professor MILLARD.

Slide rules; construction of net work charts and alignment charts for the solution of equations; and derivation of empirical equations from experimental curve.

3P57, 3P58. **Heat Engineering.** Throughout the year. Prerequisite, 3P32. Must be accompanied or preceded by 3P41 and 3P42. Professor MACKEY. Two lectures and two computation periods a week.

Properties of mixtures, dimensional analysis, fluid flow, heat transmission, selection of fans and pumps and refrigeration; applications to problems in air conditioning.

3P61, 3P62. **Advanced Heat-Power Engineering.** Throughout the year. Credit two hours a term. Two recitations a week. Professor ELLENWOOD.

Consideration of advanced problems dealing with internal-combustion-engine and steam-power plants.

3P63. **Advanced Thermodynamics.** Second term. Two recitations a week. Prerequisite, permission of the instructor. Mr. WRIGHT.

The Carnot Principle; temperature scales; entropy; the state properties of a substance; their experimental determination and correlation; equations of state; kinetic theory of gases; mixtures of ideal gases; special topics in mathematics will be considered as needed.

3P70. **Advanced Heat-Power Engineering Research.** Either or both terms. Work and credit as arranged. Professors ELLENWOOD and MACKEY.

Advanced analytical and experimental investigations in this field.

The following group offerings for seniors may be used as minors by graduate students:

Option A—Power-Plant Engineering: 3P44, 3P45, 3P46, 3P47, 3P50.

Option B—Heat Engineering: 3P57, 3P58, 3P49.

TOPICS SUGGESTED FOR ADVANCED WORK

Advanced Engineering Thermodynamics.

Steam Engineering.

Internal Combustion Engineering.

Economic Studies.

Heat Transmission.

Fuels, Combustion, Burners, Furnaces.

Flow of Fluids through Closed Conduits; Power Plant Piping.

Refrigeration.

Compressors and Pneumatic Machinery.

Air Conditioning.

Power and Heating Projects.

HIGHWAY ENGINEERING

Professors W. L. CONWELL and GILMORE D. CLARKE.

The laboratories for the examination of non-bituminous and bituminous materials and their utilization, soils, subgrade stabilization problems, etc., are located in the School of Civil Engineering. The other laboratories of the School of Civil Engineering, equipped for examining the properties of engineering materials, and the Ceramic Laboratory of the Department of Geology are also available for graduate work in Highway Engineering.

In addition to the scheduled courses for the graduate student, there is much graduate work of an independent character which requires investigation by the student and frequent conferences with staff members. Occasional field trips are also made.

Note: For courses in design of highway structures such as large bridges, see Structural Engineering.

265. *Highway Engineering.* Either term. Credit three hours.

265-A. **Low Cost Roads.** Either term. Credit three hours. Prerequisite, 265 or its equivalent. Professor CONWELL.

Study of economic importance of routes and selection of farm to market roads to be improved; location and design; subgrade soils and stabilization of subgrade soils by use of admixtures, chemicals, and bituminous materials; drainage and drainage structures; bituminous treatments and bituminous mats for stabilized subgrades. Survey of the experimental work in the use of materials and design and construction of low cost roads. Design, construction, and maintenance of road mixes, plant mixes, etc.

266. **Highway Laboratory.** Either term. Credit three hours. Prerequisite, 265 or its equivalent; may be taken concurrently with course 265. Professor CONWELL.

Non-bituminous and bituminous materials are tested. Subgrade soils are sampled and their properties examined; subgrade stabilization admixtures are also tested and studied. Bituminous mixtures are designed and their properties examined.

266-A. **Advanced Highway Laboratory.** Either term. Credit three hours. Prerequisites, 265 and 266. Professor CONWELL. Two laboratory periods a week.

Non-bituminous and bituminous materials are tested and their characteristics studied. Soils are sampled and examined, and investigations made of the behavior of mixtures of soils with bituminous and non-bituminous materials. Special investigations and tests are made to determine the properties of various combinations of materials and the effects of modifications in design.

267. **Advanced Highway Engineering.** Second term. Credit three hours. Prerequisite, 265 or its equivalent. Professor CONWELL. This course is conducted as a seminar. Meetings are held once each week at hours to be arranged.

The topics for assignment and discussion include the economics of highway engineering, highway finance, legislation, regulation, traffic, design, construction, and maintenance of highways, the latest research programs and reports, labor and plant organization for various kinds of highway contracts with especial emphasis on the economics of contracting, etc.

268. **Modern Highway Planning and Design.** Second term. Credit three hours. Prerequisite, 265 or its equivalent. Professors CLARKE and CONWELL.

Study of geographical, political, and economic divisions of communities with particular reference to highway transportation requirements; analysis of regional plans chiefly concerning the classification of roads and the selection of routes to be abandoned or improved, based upon their economic justification. Design of regional systems of highways, freeways, and parkways, including the consideration of the economic, safety, and aesthetic aspects. Traffic studies, legislation, financing, and zoning. Design of intersections and grade separations. Problems and reports required.

291 (g). **Highway Engineering Design.** Either term. Credit three or more hours. Prerequisites, 265, 270, 271, and 280. Professor CONWELL. Conferences to be arranged.

The problems are those encountered in the selection, location, design, and con struction of highways. They include the following: economic selection of routes, economic location, design of highways, highway intersections, culverts, highway bridges, retaining walls, and other highway structures. Bills of materials and estimates of cost are usually required, also plant layouts and methods of executing work.

297 (g). **Research in Highway Engineering.** Either term. Credit three or more hours. Prerequisites, 265 and 266. Professor CONWELL. Hours to be arranged.

Studies of traffic and traffic regulation and legislation may be made. The field of economics of highway engineering offers a wide variety of problems. Laboratory investigations of subgrade soils, subgrade stabilization, and the effects of modifications in design of bituminous and non-bituminous mixtures provide a wide range of topics for research.

HYDRAULICS AND HYDRAULIC ENGINEERING

(In Civil Engineering)

Major work in Experimental Hydraulics, Theoretical Hydraulics, or Hydraulic Engineering may consist in part (subject to the thesis requirement) of advanced courses, or the entire minor work may consist of such courses accompanied by special work and reports as may be arranged with the members of the special committee.

A candidate for the degree of Master of Civil Engineering (or of Science), or Doctor of Philosophy, who desires to take either a major or a minor subject in these fields of study must ordinarily have completed, preliminary to graduate work, courses in Hydraulics (including laboratory), Municipal Sanitation (including sewer design and construction and sewage disposal), and Water Supply, substantially equivalent to these courses as required of all undergraduates in the School of Civil Engineering. If a graduate student lacks one or more of these preliminary courses or considerable portions of any of them, more than the minimum period of residence may be necessary.

HYDRAULICS

Professor E. W. SCHODER.

For major work in Experimental (or Theoretical) Hydraulics the thesis requirement may be satisfied by individual experimental (or theoretical) investigation and a thesis based thereon. The tendency is to underestimate the time required for preliminary thesis work and that necessary for a thorough digestion of results. Consequently the work should be begun, if possible, during the first term of residence.

240. *Hydraulics* (including laboratory work). Either term. Credit four hours.

241. **Advanced Hydraulics.** Second term. Credit three hours. Prerequisite, Hydraulics 240 or the equivalent. Professor SCHODER. Lectures, recitations, and problems. Three hours a week.

Topics selected from the following list are taken up, subject to changes to suit group requirements: stability of flotation; barometric levelling; flow over weirs and dams, free and submerged; backwater and non-uniform flow in open channels; the hydraulic jump; water hammer; surges in pipes and canals; viscous flow of fluids and flow of air in pipes; hydraulic similitude and flow in models; some introductory elements of hydrodynamics; impulse wheels and turbines; centrifugal pumps.

242. **Hydraulic Measurements.** First term. Credit three hours. Prerequisite, Hydraulics 240 (including the laboratory) or the equivalent. Professor SCHODER. Three periods a week in laboratory or computing room.

Experimental studies involving usually (as time permits): current meters and floats in canal or river; Pitot tubes in pipes; water meters; weirs; the hydraulic jump; special features of orifices, nozzles, Venturi meters, pipe moder studies; such other occasional experimental measurements as opportunity offers in the laboratory or in the neighborhood of Ithaca; the determination of efficiency, capacity, and characteristics of hydraulic machinery by tests.

297 (c). **Hydraulic Research.** Professor SCHODER.

The subject and scope of the investigations in experimental or theoretical hydraulics should be selected by conference at the beginning of the term if not previously arranged. It is often desirable and is permissible for two students to work together on the same investigation. Written reports are required but the test need not be typewritten in thesis style. These reports are kept by the department. In most cases it is necessary to arrange a definite schedule for work in the laboratory to avoid conflicts.

HYDRAULIC ENGINEERING

Professor F. J. SEERY.

For the master's degree with major work in Hydraulic Engineering the thesis requirement of the Graduate School may be satisfied by work involving original

designs, estimates, or analyses based on actual engineering data, these to be gathered by the student himself as an essential part of advanced work in this field. The requirement may not be satisfied by the so-called descriptive type of thesis with only rather vague design based on assumed data.

Ordinarily a candidate for the Ph.D. degree who elects most of his work in the general fields of hydraulic engineering and hydraulics is required to select his thesis in experimental or theoretical hydraulics. Only when the candidate has an adequate background of practical experience and mature judgment will a doctor's thesis in hydraulic engineering be permitted.

230. *Water Supply.* Either term. Credit three hours.

231. **Hydraulic Construction.** Second term. Credit three hours. Prerequisite, 230 or the equivalent. Professor SEERY.

This is a computing and designing course dealing with problems of water storage and the design and construction of dams by means of lengthy problems to be solved by graphical and analytical methods and involving the economics of water storage at a given site; the design of a high masonry dam by Wegmann's Method and the tests for safety and stability of design, and the analysis of stresses and stability.

232. **Water Power.** Either term. Credit three hours. Prerequisites, 230 and 240, or the equivalent. Professor SEERY. Three lectures and recitations a week and the working of three lengthy problems during the term.

The subject matter of the course covers the technique of hydraulic turbines, the analysis of test data, study of the adaptation of turbine types to working conditions, unsteady flow and surging in long conduits, governing, and the analysis of the power available at a low head millsite.

233. **Hydraulic Engineering.** First term. Credit three hours. Prerequisite, 230 or the equivalent. Professor SEERY. Lectures, recitations, and abstracting of references.

Theory of percolating water, ground water development, recent developments in soil technology and the design and construction of earthen dams and levees; theory of design of gravity and arch masonry dams and distribution of stresses in such structures; spillway design; preparation of dam sites; construction methods and plants.

234. **Conservancy and Reclamation Problems.** Second term. Credit three hours. Prerequisites, 230 and 240, or the equivalent. Professor SEERY. Lectures, recitations, and abstracting of references.

Flood flow estimates; planning for and designing of flood protection structures, irrigation and drainage works. The Miami Conservancy work will be the chief source of material for the course.

236. **Water Power and Pumping Plants.** Second term. Credit three hours. Prerequisite, 232. May be taken concurrently with course 232. Professor SEERY.

This is a computing and designing course devoted to the problems of designing and detailing power and pumping plants.

291c. **Hydraulic Engineering Design.** Second term. Credit three hours. Prerequisite, 240. For best results Hydraulic Design should be preceded by course 230, but the two may be taken concurrently. Professor SEERY.

The purpose of the course is to go more into detail in selected phases of hydraulic engineering and is not to duplicate in large part work regularly given in the scheduled courses in hydraulic and structural engineering.

TOPICS SUGGESTED FOR ADVANCED WORK

Hydraulic Turbines.
Draft Tube Design and Performance.
Centrifugal Pumps.
Economics of Water Power Plants.

INDUSTRIAL ENGINEERING

Professor C. I. MILLARD.

The departmental library of literature on Industrial Engineering subjects is available for the use of graduate students. In the micro-motion laboratory 16 mm. motion picture cameras and projectors with the necessary auxiliary apparatus are available for motion and process studies as well as the necessary tools and work places for setting up and studying various operations.

The courses offered include a consideration of the organization, administration, and selection and location of equipment for industrial enterprises.

Formal graduate courses are offered and facilities are available for original work in the field of Industrial Engineering.

To take advanced work in this department the student must have had the equivalent of the undergraduate courses 3A35, 3I43, 3I44, and 3A31. Students desiring to take a minor in this field may enroll for the following courses for which they have had the necessary prerequisites.

3I43, 3I44. *Industrial Engineering.* Throughout the year. One lecture and two computing periods a week.

3I48. *Industrial Engineering Economy.* Second term. Two recitations or discussion periods a week.

3I51. **Advanced Industrial Engineering.** Either or both terms. Credit one hour for forty hours of actual work. Open to a limited number of seniors and graduates. Assistant Professor MILLARD and Mr. OLSEN.

Special problems and investigations which are carried on under the direction of members of the department staff.

3I52. **Industrial Auditing.** Second term. One lecture and one computing period a week.

3I54. **Motion and Time Study.** Either term. One recitation and one laboratory period a week.

TOPICS SUGGESTED FOR ADVANCED WORK

Micro-motion analysis.

Investigations for motion and process economy.

Practical economic and production investigations in near-by industries.

Economic control of quality in production.

MACHINE DESIGN

Professors C. D. ALBERT, F. S. ROGERS, P. H. BLACK, and W. A. JOHNSON.

Under this head is included advanced work in kinematics and dynamics, machine design and design methods, and special design problems and investigational work.

There are eight well-equipped drawing rooms and a very complete collection of Kinematic models. The Department Library, the Library of the School of Mechanical Engineering, and the University Library have a very complete collection of books on kinematics, machine design and construction, mechanical technology, structural design, and other books on related subjects.

3D21. *Kinematics, Recitations.* First term. Credit two hours.
3D23. *Kinematic Drawing.* First term. Credit two hours.
3D24. *Kinematics, Recitations and Drawing.* Second term. Credit three hours.
3D25. *Kinematics, Recitations.* Second term. Credit three hours.
3D26. *Kinematic Drawing.* First term. Credit two hours.
3D31. *Machine Design, Recitations.* First term. Credit two hours.
3D32. *Machine Design, Recitations.* Second term. Credit two hours.
3D33. *Machine Design, Drawing.* Second term. Credit three hours.
3D34. *Machine Design, Recitations.* First term. Credit two hours.
3D35. *Machine Design, Drawing.* Second term. Credit two hours.
3D36. *Machine Design, Drawing.* Second term. Credit one hour.

3D51. *Tool Engineering.* Second term. Credit two hours. An elective for juniors and seniors in engineering. Assistant Professor JOHNSON. One discussion and one computing period a week.

The course deals with the theory and principles of operation underlying the design of punches, dies, jigs, and fixtures and with the application of such tools to the production of parts of appliances and machines in small and in large quantities.

3D52. **Advanced Kinematics and Kinetics.** Second term. Prerequisites, 3D21, 3D23, and 3D24 or 3D25 and 3D26. Professor ROGERS or ————. Two lecture and discussion periods and one laboratory period a week.

Graphical and semi-graphical treatment of linear and angular velocities and accelerations and of the resulting forces, stresses, and strains due to the form and mass of the moving parts of mechanisms and machines. Vibration and critical speeds and the theoretical basis and use of balancing machines for securing static and running balance of machine parts, will be treated so far as time permits.

3D53. **Materials Handling.** Second term. Prerequisites, 3D21, 3D23 and 3D24, or 3D25 and 3D26. Professor ————. Two lectures a week.

Treatment and analysis of the known methods of handling different kinds of materials and of the principles and considerations involved in a proper choice of the method of handling any given kind of material.

3D54. **Dynamics and Vibrations of Machinery.** First term. Credit three hours. Prerequisites, 3D32 or 3D34 and 3M24. Assistant Professor BLACK. Two lecture and discussion periods and one laboratory period a week.

Graphical and analytical treatment of velocities, accelerations, static forces, inertia forces, and combined forces. Balancing of engines. Transverse and torsional vibrations, critical speeds, and balancing machines.

3D55. **Advanced Machine Design.** Second term. Credit three hours. Prerequisites, 3D32 or 3D34 and 3M42. Assistant Professor BLACK and ————. Three lecture and discussion periods a week.

Advanced problems in stress and analysis of machine and structural members including consideration of fatigue, creep, stress concentration, stability, etc. Vibrations and a few special topics.

3D56. **Design of Pressure Vessels.** Second term. Credit two hours. An elective for seniors in engineering and an alternative course for Option I. Mr. CARRIER. One discussion and one computing period a week.

The course deals with the design of thin and thick pressure vessels under internal or external pressure or both and with the stresses in such vessels and in flat plates, flanges, heads, openings, and connections.

3D57. **Welding in Machine Design.** Second term. Credit two hours. An elective for seniors in engineering and an alternative course for Option I. Professor ALBERT. One discussion and one computing period a week.

The course deals with flame cutting and methods of welding, with shrinkage, warpage, and stress relieving, with inspection and testing, with the design of welded joints, and with the application of fusion welding in the design of appliances and machines.

3D59. **Special Investigations in Machine Design.** Either or both terms. Credit as arranged. Professors ALBERT, ROGERS, or BLACK. Opportunity is offered to qualified students, individually or in small groups, to pursue, under direction, special investigations in machine design and related fields.

TOPICS SUGGESTED FOR ADVANCED WORK

Kinematics and Dynamics.

Special Design Problems.

Vibrations and Critical Speeds.

Investigational Work.

MANAGEMENT ENGINEERING

Professors F. A. BARNES, CARL CRANDALL, J. E. PERRY, and R. Y. THATCHER.

The study of methods of construction is neglected in some colleges and the graduate student who is not familiar with them may well take course 264. Books and periodicals on construction methods for various types of work, on management of construction work, and laws and practices governing it are available in the Library of the School of Civil Engineering.

264. *Engineering Construction.* Either term. Credit three hours.

290. *Engineering Law.* Either term. Credit three hours.

293. *Engineering Management.* Either term. Credit three hours.

290-A. **Advanced Engineering Law.** Second term. Credit three hours. Prerequisite, 290. Professor BARNES and Assistant Professor THATCHER. Lectures and recitations, three hours a week.

Some of the topics treated in course 290 are here enlarged upon and extended, particularly laws relating to the various phases of construction contracts, employer-employee relationship, workman's compensation, mechanics liens, patents, copyrights, trademarks, and insurance. Among other subjects covered are suretyship, conditional sales, bailments, trusteeship, and taxation. Actual cases are used for illustrating the above and reference is also made to recent court decisions regarding engineering matters.

295. **Valuation Engineering.** Second term. Credit three hours. Prerequisites, 264 and 290. May be taken concurrently with course 290. Professor BARNES and Assistant Professor CRANDALL. Lectures, recitations, and reports.

Theory and practice of valuation or appraisal for purposes of utility rate making, purchase or sale, eminent domain or condemnation cases, mergers or joint ownership, taxation and assessment, issuance of securities, bank loans, insurance, uniform system of accounting and improved management. Topics considered include scientific systems of real estate assessment, federal railroad valuation, rate disputes, court rulings, computation of actual rates for gas, telephone, electrical supply and street railways, valuation of land, mines, water power, factories, railroads, toll bridges, buildings, and all kinds of property both tangible and intangible. Detailed examples of forms and methods with outline of typical valuation reports.

297 (h). **Research in Management Engineering.** Either term. Credit three hours or more. Professor BARNES.

Special problems relating to the economic, legal, and financial aspects of engineering construction projects, management of public works and appraisals.

MATERIALS OF ENGINEERING

(In Civil Engineering)

Professors H. H. SCOFIELD and T. R. CUYKENDALL.

The library of the School of Civil Engineering is well supplied with reference works of various kinds on the subject of structural materials, their properties, specifications, and tests. Especial effort is made to add continually the most recent investigations and researches as the results find their way into print.

The laboratory equipment is selected to make all ordinary and many special tests and investigations of the materials of construction. The cement and concrete laboratories are equipped to make all the standard tests upon cement and the various other ingredients entering into concrete. A speciality is made of the tests and investigations of the finished concrete under various conditions as to proportion, manufacture, and design.

225. *Materials of Construction.* Either term. Credit three hours.

226. *Materials Laboratory.* Either term. Credit three hours.

297 (b). **Engineering Research in Materials.** Either or both terms. Credit one hour for forty hours of actual work. Prerequisites, 225 and 226 or their equivalents. Professor SCOFIELD.

Special investigations of an advanced nature of the properties of structural units and the materials of construction. The aim of the course is to secure results by proper investigational methods which are of the caliber and scope deemed essential for publication.

(*In Mechanical Engineering*)

Professors J. R. MOYNIHAN, J. O. JEFFREY, and G. B. UPTON.

Experimental problems relating to the origins and control of the properties of ferrous and non-ferrous metals, woods, etc., may be carried on in this department. For advanced work in this field the student must have had course 3X31 or its equivalent. Advanced work is also offered in Applied Metallography.

The Materials Testing Laboratory. This laboratory is equipped for tension and compression tests with an Olsen 200,000-lb. machine, an Olsen 100,000-lb. three-screw machine, an Amsler 100,000-lb. hydraulic machine, a Baldwin-Southwark 50,000-lb. universal machine, together with several other machines varying in capacity from 10,000 to 100,000 pounds. There are an Olsen torsion machine of 200,000 inch-pounds capacity, two Upton-Lewis fatigue testing machines, a R. R. Moore high-speed fatigue tester, and an Amsler-Charpy-Izod impact testing machine. The other equipment includes hardness testing machines, metallographic microscopes, polishing equipment, extensometers, gas and electric furnaces, tempering baths, and other apparatus required for the determination of and the control of the physical qualities of engineering materials.

3X21, 3X22. *Materials of Engineering.* Throughout the year. Three lectures a week.

3X31. *Materials Testing and Physical Metallurgy.* First term. One laboratory period a week and a written report of the work.

3X52. **Applied Metallography.** First term. Credit two hours. Prerequisites, 3X21, 3X22, and 3X31. Professor UPTON.

Covers in historical sequence the development of knowledge of the internal structure of metals, and the relation of structure and properties; the technique of metallographic research, study of application of the laws of physical chemistry to interpretation and correlation of results. Study of stable and metastable conditions; heat treatment theory and practice. The practical aim of metallography is constantly emphasized.

TOPICS SUGGESTED FOR ADVANCED WORK

Properties of Engineering Materials.
Thermal Qualities of Quenching Liquids.
Control of Properties of Engineering Materials.

MECHANICAL PROCESSING

Professor E. H. CARRUTHERS.

The shops available for graduate research include the following: forge shop, foundry, welding shop, pattern shop, and machine shop. The shops are also available for use in the building of equipment for research in any department. Arrangements for the construction of new equipment should be made in advance with the head of the department.

3S11. *Metal Working.* Either term. One laboratory period a week.
3S14. *Casting Processes.* Either term. One laboratory period a week.
3S15. *Casting Processes.* Either term. Two laboratory periods a week.
3S23. *Machine Tool Processes.* Either term. Two laboratory periods a week.
3S24. *Measuring Instruments.* Either term. One laboratory period a week.

3S50. **Advanced Mechanical Processing.** Either term. Work and credit as arranged. Professor CARRUTHERS.

TOPICS SUGGESTED FOR ADVANCED WORK

Cupola practice; foundry practice.
Selection, testing, and handling of foundry sands.
Arc and other types of welding.
Machinability of materials.
Cutting tools; cutting and dynamometric studies.
Dies, jigs, and fixtures.
Measuring and gaging.

MECHANICS

(In Civil Engineering)

Professors J. N. GOODIER, E. V. HOWELL, T. R. CUYKENDALL, and H. M. GIFFT.

An extensive departmental library in Lincoln Hall, in addition to the University Library, affords facilities for advanced work in the field of applied mechanics especially in applications such as occur in structural engineering.

The prerequisite training for graduate work in this subject should cover the fundamental principles and applications in mathematics, physics, materials, mechanics, and structural design required for graduation in civil engineering at Cornell University. Many of the advanced treatises are in French and German, and an ability to read technical works in these languages is extremely valuable.

220. *Mechanics of Engineering.* Either term. Credit five hours.

220-A and 220-B. *Mechanics Laboratory and Computations.* First term. Credit two hours.

221. *Mechanics of Materials.* Second term. Credit four hours.

221-A. *Mechanics Laboratory.* Second term. Credit one hour.

222. **Advanced Mechanics.** Either term. Credit three hours. Prerequisites, 220 and 221. Professor HOWELL. Three recitations a week.

Following a brief general review of fundamental topics in Mechanics of Materials, this course covers: induced stresses, torsion; unsymmetrical bending; torsion of prisms of non-circular section; hoops; flat plates; localized stresses; theory of least work; internal work and its derivatives.

223. **Engineering Problems.** Either term. Credit two hours. Prerequisites, 220, 221, and 240. Two computing periods a week.

224-A. **Engineering Mathematics.** First term. Credit three hours. Prerequisite, Mathematics 55. Three recitations a week.

An elementary course in ordinary differential equations with applications to engineering problems. Trigonometry, calculus, and algebra are dealt with in so far as this is necessary for a clear understanding of the treatment of differential equations. The purpose of this course is to lay the foundation for the more advanced courses in engineering mathematics.

224-B. **Advanced Engineering Mathematics.** Second term. Credit three hours. Prerequisite, 224-A.

This course is an introduction to the mathematics used in the solution of advanced engineering problems. Special emphasis is given to partial differentiation. Fourier Series, line integrals, formation of partial differential equations, integration in form of infinite series of several of the partial differential equations arising in engineering problems, vector notation, conformal representation, determinants, theory of the complex variable, development of function into series, etc., are reviewed in so far as a knowledge of these is essential to the course.

224-C. **Advanced Differential Equations.** First term. Credit three hours. Prerequisites, 224-A and 224-B or their equivalents. Assistant Professor CUYKENDALL.

A systematic study of differential equations. Partial differential equations and their solutions are emphasized.

224-D. **Special Mathematical Topics.** Second term. Credit three hours. Prerequisites, 224-A and 224-B. Assistant Professor CUYKENDALL.

The content of this course depends largely upon the needs and the interests of those enrolled. Generalized coordinates, vector analysis, and the calculus of variation are three subjects to be considered.

228-A, B. **Applied Elasticity.** Throughout the year. Credit three hours each term. Prerequisites, 224-A, 224-B, or Mathematics 200 or 70. Professor GOODIER.

General theorems of the elastic solid, reciprocal theorem, sudden loading. Tension, flexure, and torsion of bars of arbitrary section. Castigliano's theorem with application to frames, rings loaded in and normal to plane, spiral, and helical springs. Stress in thick cylinders and discs due to pressure, heating, and rotation. Beams on elastic foundations. Symmetrical deformation of thin tubes. Propagation of stress waves in bars.

In the second term the topics are chosen from: Thermal stress, stress-analysis, stability, and vibration, of plates and shells. Vibration of beams.

228-C. **Engineering Physics of Metals.** Second term. Credit three hours. Assistant Professor CUYKENDALL.

An introduction into the physical basis of matter in relation to its elastic and plastic behavior. Topics for discussion include: Atomic basis of generalized Hooke's Law, atomic cohesive forces and potential troughs, the yield value, primary bonds, dipole and Van der Waal's forces, influences of temperature on elastic properties, thermoelastic basis of internal friction, experimental and theoretical strength of crystals, distortion of the lattice, Smekal's criticism of Born's lattice theory of metals, evidence of submicroscopic structure, elementary concepts of the cooperative phenomena in metals.

[229-A. **Theory of Elastic Stability.** First term. Credit three hours. Prerequisite, course, 3M22a, 3M22b, 3M24, or equivalents. Professor GOODIER. Given only in alternate years. Not given in 1942–43.]

Mathematical analysis of the conditions under which columns, beams, rings, tubes, thin plates and thin curved shells may fail by general or local buckling. Applications to mechanical, civil, naval, and aeronautical structures.

229-B. **Mechanics of Vibration.** First term. Credit three hours. Prerequisite, 3M24. Professor GOODIER. (Given only in alternate years. To be given in 1942–43.)

The characteristic phenomena of mechanical vibrations encountered in engineering, and their quantitative investigation, illustrated by a group of typical vibrating systems. Representation of simple harmonic motion. Combination of several simultaneous motions. Simple cases of free and forced vibrations, with damping. Resonance. Principles of transmission and isolation of vibration. Systems of variable mass and variable elasticity. Vibrations of taut wires, bars, beams, rings, membranes, and plates. Relation of vibration and noise. Detection and measuring instruments. Examples of diagnoses and preventive measures.

(*In Mechanical Engineering*)

Professors J. N. GOODIER, W. R. CORNELL, H. C. PERKINS, G. H. LEE, and W. T. THOMSON; *Doctor* D. C. DRUCKER.

The libraries of the university are well equipped for students engaged in both analytical and experimental investigation. In addition to the regular laboratories, facilities are available for the construction and accommodation of special apparatus for research and testing. These include a photo-elastic laboratory for investigation of two- and three-dimensional stress.

3M21. *Theoretical and Applied Mechanics.* Either term. Five hours a week.

3M22a. *Strength of Materials.* Five hours a week for nine weeks of second term.

3M22b. *Strength of Materials, continued.* Five hours a week for the last six weeks of second term. Repeated in first term, two hours a week.

3M23. *Hydraulics.* Five hours a week for six weeks of second term.

3M24. *Applied Mathematics.* Second term. Three hours a week.

3M33. *Fluid Mechanics.* First term. Three recitations and one lecture a week.

3M55. **Photoelasticity.** First term. Prerequisite, 3M22b. Professor GOODIER and Dr. DRUCKER. Two lectures or laboratory periods and report a week.

The optics of photoelasticity, the stress-optical effect, plane and circularly polarized light, white and monochromatic. Elements of elasticity required for the analysis of observations and the determination of principal stresses.

3M56, 3M57. **Applied Elasticity.** Throughout the year. Credit three hours each term. Prerequisites, 3M24 or 224-A or Mathematics 41 for first term and 224-B for second term. Either term may be taken separately. Elective for graduates, but open to qualified undergraduates. Professor GOODIER. Three lectures a week.

The first term will be devoted to topics in stress-analysis, elastic vibrations, and elastic stability, which can be treated by elementary mathematical methods, such as those employed in simple tension, bending, and torsion. These topics will include effects of sudden loading; the propagation of waves of stress; the approximate determination of vibration frequencies and buckling loads; bending of beams on elastic foundations; bending of flat strips and circular plates; stress in thin shells due to internal pressure and due to heating; the concentration of stress by holes and notches; the relation of stress-analysis to fatigue testing.

In the second term more critical discussion, using more advanced methods, will be given to further problems according to the requirements of the group.

[3M58. **Mechanics of Vibration.** First term. Credit three hours. Prerequisite, 3M24 or its equivalent. Professor GOODIER. Given in alternate years, not in 1942–43.]

The characteristic phenomena of mechanical vibrations encountered in engineering, and their quantitative investigation, illustrated by a group of typical vibrating systems. Representation of simple harmonic motion. Combination of several simultaneous motions. Simple cases of free and forced vibrations, with damping. Resonance. Principles of transmission and isolation of vibration. Systems of variable mass and variable elasticity. Vibrations of taut wires, bars, beams, rings, membranes, and plates. Relation of vibration and noise. Detection and measuring instruments. Examples of diagnosis and preventive measures.

3M59. **Seminar in Applied Mechanics.** Either or both terms. Credit one hour each term. One discussion period each week. Prerequisites, 3M56 and 3M57 or equivalents. Professor GOODIER.

Current research papers in applied mechanics reported and discussed by members of the group.

[3M60. **Theory of Elastic Stability.** First term. Credit three hours. Prerequisites, 3M22a, b, 3M24, or equivalents. Professor GOODIER. Given in alternate years, not in 1942–43.]

Mathematical analysis of the conditions under which columns, beams, rings, tubes, thin plates, and thin curved shells may fail by general or local buckling. Applications to mechanical, civil, naval, and aeronautical structures.

3M61. **Advanced Fluid Mechanics.** Second term. Credit three hours. Prerequisites, 3M23 or 33, 3M24, or equivalents. Mr. KOCH.

The study of various fluid phenomena, modern methods of rational analysis being correlated with empiricism and research; dimensional analysis; elementary principles of flow; generalized equations; irrotational motion, conformal mapping; fundamental equations of viscous flow; fluid turbulence; boundary layer phenomena; flow around immersed bodies; flow in closed conduits; flow in open channels; wave phenomena.

TOPICS SUGGESTED FOR ADVANCED WORK

Theory of Elasticity.
Elastic Stability.
Vibration.
Photo-elastic Stress Analysis.
Fluid Motion.

RAILROAD ENGINEERING

Professors F. A. BARNES, CARL CRANDALL, J. E. PERRY, and R. Y. THATCHER.

The Library of the School of Civil Engineering contains an excellent collection of books, periodicals, and publications of railway and other technical societies

dealing with the location, construction, maintenance, and operation of railroads. Books and other publications on transportation are available either in this collection or in the University Library. Maps and profiles are available for studies of the economics of location, and special plans provide for studies of signal layouts, interlocking, and yard and terminal design. Instrumental equipment is available for securing data for special problems in relocation and for designs of structures.

260-A. *Location Surveying.* Credit one hour. One week during summer vacation following sophomore year.

260-B. *Route Surveying and Drawing.* Second term. Credit three hours.

261. **Railroad Maintenance of Way.** First term. Credit three hours. Prerequisite, 260-B. Professor BARNES and Assistant Professor PERRY. Lectures and recitations three hours a week.

The subjects treated are track materials (with special reference to the section, method of manufacture and composition of steel rails, to the economics of tie preservation and the use of metal ties, and to the effect of quality of ballast upon maintenance); machine and other methods of grading for second track; drainage; track laying by both machine and hand methods; ballasting and bringing new track to line and grade; turnouts and switches; derailing switches; side tracks and yard tracks; sorting and terminal yards; track maintenance; track tools, work trains; action of car wheels on curves; widening of gage; double tracking; separation of grades; and improvement in grades and alinement.

262. **Railroad Operation and Management.** Second term. Credit three hours. Prerequisite, 260-B. Professor BARNES and Assistant Professor PERRY. Lectures and recitations three hours a week.

Under organization, the following subjects are treated: general principles underlying organization and the effect of each on efficiency; principal departments of railway service with a brief outline of the work of each; departmental and divisional systems of organization, with examples on various roads and discussion of adaptability of each. The duties of officers and the work of the different departments are taken up in considerable detail. The most important laws affecting railroads are given in discussing the work of the legal department. Freight traffic, freight houses, classification yards, car service rules, accounting, etc., are among the topics considered under operation. Signaling and interlocking and train rules are also considered.

263. **Route Location.** Second term. Credit three hours. Prerequisites, 260-A and 260-B. Professor BARNES. Lectures and recitations with problems involving investigations of projects, revisions, and comparisons of alternate routes. Three hours a week.

A detailed study is made of the economic principles and other factors governing the location of new routes for both railroads and highways, and the revision of existing lines to effect the most efficient and satisfactory transportation. Some of the topics treated are estimation of traffic and revenue; costs and rates; steam, electric, and other locomotive and motor operation; gradients, distance, curvature and rise and fall; line and grade revisions; grade crossing eliminations; location surveys and estimates.

269. **Transportation.** Second term. Professors BARNES, CONWELL, and Assistant Professor PERRY.

A course covering travel and transport agencies with special reference to their facilities, ownership, financing, regulation, and coordination. A brief review of the development of transportation throughout the world is used as a background for an intensive study of the present situation in the various countries and comparison of the policies and practices in use. Particular attention is given to the various proposals designed to promote more efficient use of the various transportation agencies in the United States by better coordination, pooling of facilities, etc., and economic studies are made of some of the new projects which are under discussion.

291 (e). **Railroad Engineering Design.** Either term. Credit three or more hours. Professor BARNES and Assistant Professor PERRY.

The problems are those encountered in the location and construction of railroads, and include the following subjects: economic location of railroads; culverts;

bridges; retaining walls; tunnel and subway design; small depot buildings; freight houses; water supply and coaling plants; icing stations; turntables and engine-houses; gravel washing plants; track layouts with details of signals and interlocking; yard and terminal design, etc. Bills of material and estimates of cost are usually required. The field is so broad that the interest of the student is given consideration in assigning problems.

297 (e). **Railroad Engineering Research.** Either term. Credit three or more hours. Professor BARNES.

Special problems in the economics of location, construction, maintenance, and operation of railroads, comparison of transportation agencies, traffic studies, and economics of various systems of transport.

Note: For the larger railway structures see STRUCTURAL ENGINEERING.

In addition to the above courses, the student may take courses in other departments if time permits; such as courses in transportation in the College of Arts and Sciences, or in applications of electricity in transportation in the School of Electrical Engineering.

SANITARY ENGINEERING

Professors C. L. WALKER and WILLIAM E. STANLEY.

Courses offered to graduate students may be divided into two classes: those fundamental studies in Chemistry, Biology, and Bacteriology, which the undergraduate student in Civil Engineering has not had an opportunity of pursuing; and those dealing with the design, construction, and operation of sewage treatment and water purification plants. The sewage treatment and water purification plants in the City of Ithaca and in neighboring communities offer opportunity for experimental study.

A well-equipped sanitary laboratory established in the School of Civil Engineering provides an opportunity for students to acquire laboratory technique in water and sewage analyses, and also a practical training in interpretation. The Kuichling Library for Hydraulic and Sanitary Engineering, and the main library of the School are well provided with the literature dealing with Sanitary Engineering topics.

250. *Sanitary Biology.* First term. Credit three hours.
251. *Sanitary Biology.* First term. Credit two hours.
252. *Sewerage and Sewage Disposal.* Either term. Credit three hours.
253-A. *Treatment of Water.* Second term. Credit two hours.
258. *Water and Sewage Analysis.* First term. Credit two hours.

253. **Control and Treatment of Water Supplies.** Second term. Credit three hours. Professor STANLEY. Two recitations and one computation period a week.

This course comprises a comprehensive study of the general principles and methods involved in furnishing safe water supplies of satisfactory quality. The topics studied include the character of surface and underground water supplies; inspection of sources; relation of communicable diseases to water supplies; standards of quality and safety of supplies; water treatment methods including coagulation, sedimentation, aeration, slow and rapid sand filtration, tastes and odor control, softening and iron removal, corrosion control, sterilization, and miscellaneous treatment methods. Also some study of the design and operation of water treatment plants is included.

254. **Sewerage Works.** First term. Credit three hours. Prerequisite, 252. Professor STANLEY. Two recitations and one computation period a week.

A comprehensive study of principles and methods involved in the design, construction and operation of sewers and sewage treatment works including reference to existing typical plants. In general, the study includes the determination of capacity and design of sewers; the disposal of sewage by dilution and broad irrigation; stream pollution and self purification; sewage treatment methods including preparatory devices, sedimentation, chemical precipitation, intermittent sand and trickling filters, activated sludge, sludge digestion, sludge dewatering and incineration, and miscellaneous treatment methods.

255. **Treatment of Wastes.** First term. Credit three hours. Prerequisite, 252. Professor WALKER. Three lectures or recitations a week.

The treatment of municipal and industrial wastes such as garbage, and the wastes from tanneries, packing-houses, mines, canning factories, textile mills, paper and pulp mills, creameries, cheese factories, condensaries, etc. Flow or process charts are used to show the general character of the waste, and methods of treatment applicable are considered. Special attention is given to experimental studies of waste treatment. Numerous references, bulletins, reports.

256. **Municipal Administrative Engineering.** First term. Credit three hours. Professor STANLEY. Lectures, recitations, and readings. Three periods a week.

A study of municipal organizations and the relationships between the civil engineer in public service and various city, county, state, federal, and special governmental bodies, with which he may become associated; the limitations on the activities of the public works agency usually imposed by law or regulations and the effect of these on the activities of the engineer; methods of financing governmental operations including bond issues, sinking funds, special assessments, service and rental charges.

256-A. **Public Health Engineering.** Second term. Credit three hours. Professor STANLEY. Lectures, recitations, and readings. Three periods a week.

A study of the position of the engineer in public health work. Organization and operation of Boards of Health, vital statistics, public health laws, and the sanitary code.

256-B. **Rural Sanitation.** Second term. Credit two hours. Professor WALKER. Lectures, reports, and recitations. Two periods a week.

A course dealing with the sanitation of rural areas, trailer and other camps, summer hotels, and swimming pools. Attention is given to water supply, sewage and garbage disposal, and to the problem of milk sanitation. Lectures, reports, and recitations.

257-A. **Conference on Present Methods of Water Treatment.** Either term. Credit three hours. Professor STANLEY. Readings, investigations, inspections, and reports. Hours to be arranged.

A critical study of selected problems in water treatment, control of watersheds; the construction and operation of existing water treatment plants.

257-B. **Conference on Present Methods of Sewage Treatment.** Either term. Credit three hours. Professor STANLEY. Readings, investigations, inspections, and reports. Hours to be arranged.

A critical study of selected problems in sewage disposal; sewage treatment methods; the construction and operation of existing sewage treatment plants.

259. **A Laboratory Course for Graduates.** Professors WALKER and STANLEY. Hours to be arranged.

A course devoted to some problems of water or sewage or trade waste, such as the operation of a water filtration plant, a sewage disposal plant, the detection, measurement, and purification of trade wastes, the value of disinfection, etc.

291 (d). **Sanitary Engineering Design.** Either term. Credit three hours. This course should be preceded by courses 252 and 253-A or equivalent courses. Professors STANLEY and WALKER.

The purpose of the course is to teach methods of determining the capacity basis of design, computations, sketches, and general plans and profiles involved in the design of sewerage works.

Problems such as the design of a separate or combined sewerage system, an intercepting sewer, a municipal or an institutional sewage treatment plant, a plant for the treatment or disposal of an industrial waste, or a plant for the treatment of an industrial, institutional, or municipal water supply, may be elected.

297 (d). **Sanitary Engineering Research.** Either term. Prerequisites for work in this field will depend upon the particular problem to be pursued, but in general will include work in water analysis, bacteriology, and courses in Hydraulics and Sanitary Engineering dealing with the field in which the work is to be undertaken.

Professors WALKER and STANLEY. Hours, credit for work, prerequisites, and other questions relating to contemplated research in this field will be arranged by conference.

STRUCTURAL ENGINEERING (INCLUDING SOIL MECHANICS)

Professors L. C. URQUHART, C. E. O'ROURKE, E. N. BURROWS, H. T. JENKINS, and C. M. PENDLETON.

In this subject instruction is offered in the determination of loading and stresses and the design of roofs, buildings, bridges, arches, foundations, piers, retaining walls, and other structures of timber, steel, and concrete.

The department is equipped with a Beggs Deformeter for the Mechanical Analysis of Structures. The facilities of the testing laboratories are available to graduate students.

The Soil Mechanics Laboratory is fully equipped for work by graduate students. The freezing room and humid room are available for research work in investigating the physical properties, bearing capacity, permeability and stability of soil, and the flow of water through earth dams. There is also a shop for use in the building of new equipment.

To qualify for graduate work in structural engineering a knowledge of theoretical mechanics, strength of materials, engineering construction, and elementary courses in stresses and design in timber, steel, and concrete are required.

270. *Stress Analysis and Structural Design.* Either term. Credit four hours.

271. *Structural Design.* Either term. Credit three hours.

280. *Concrete Construction.* Either term. Credit three hours.

281. *Foundations.* First term. Credit three hours.

287. *Soil Mechanics.* Either term. Credit three hours.

272. **Advanced Structural Analysis.** Second term. Credit three hours. Prerequisite, 270. Professors URQUHART and O'ROURKE. Three recitations a week.

Stress analysis of continuous beams, framed bents, and rigid frames. Horizontal as well as vertical loading considered. Redundant structures including the braced two-hinged arch. Displacement diagrams for trusses and arches and analytical computation of deflections of such structures.

273. **Steel Buildings.** First term. Credit three hours. Prerequisites, 220, 221, and 271, or their equivalents. Associate Professor BURROWS. Reports and drawings. Three two-hour periods a week.

This course comprises the design of the steel framework for buildings of the prevailing type used in power house or shop construction. Dead, snow, and wind stress diagrams are drawn for the roof trusses. Provision is made for an electric crane moving the full length of the building and the stresses in the framework due to the movement of the crane are determined. The effect of the wind and the eccentric load due to the crane girder are considered in the design of the columns.

274. **Bridge Design.** Second term. Credit three hours. Prerequisite, 271 or the equivalent. Associate Professor BURROWS. Computations and drawings, three two-hour periods a week.

Computations and drawings for the complete design of a railroad bridge of six or seven panels or a heavy highway bridge. The computations to determine the stresses and sections of all members, pins, pinplates, splices, deflection, camber, and other details as well as of connecting rivets are to be written up in the form of systematically arranged reports. The drawings consist of general detail plans showing the location of all rivets as well as the composition and relation of all members and connections. The final report is to give a full list of shapes and plates, and a classified analysis of weight for the span.

275. **Investigation of Existing Bridges.** Second term. Credit three hours. Prerequisite, 271 or the equivalent. Associate Professor BURROWS.

Inspection of existing structures for the determination of sizes and conditions of plates and shapes. After full data have been obtained in the field, computations will be made to determine either the unit stresses under a specified load, or the safe load or rating according to standard specifications.

282. **Reinforced Concrete Building Design.** First term. Credit three hours. Prerequisite, 280. Professors URQUHART and O'ROURKE. Seven and one-half hours a week.

Design of a reinforced concrete flat-slab building and investigation of various other types of floor systems for commercial buildings. Complete detail design for one building, including stairway, elevator shafts, penthouses, etc. Working drawings and steel schedules.

283. **Fixed Arches.** Second term. Credit three hours. Prerequisites, 270, 271, and 280. Professors URQUHART and O'ROURKE. Lectures, recitations, and computations. Six hours a week.

Theory of the curved beam; the closed ring; the fixed arch. Influence lines for arches of various forms. Selection of curvature of axis for various loadings. Effect of temperature and rib-shortening; effect of plastic flow on stresses in a reinforced concrete arch. Design of a reinforced concrete arch and its abutments.

284. **Highway Bridges.** Second term. Credit three hours. Prerequisite, 280 or the equivalent. Professor O'ROURKE.

Design of short span bridges and their abutments. Comparison of the economy of steel and reinforced concrete superstructures for bridges of this type. Reports and drawings.

285. **Reinforced Concrete Design.** Second term. Credit three hours. Prerequisite, 280. Professors URQUHART and O'ROURKE. Three two-hour periods a week.

Design of footings: single and multiple columns of reinforced concrete, I-beam grillages. Design of bins and tanks, subsurface and supported on towers. Reports and sketches.

286. **Elastic Foundations and Thin Structural Shells.** First term. Professor ————. Credit three hours.

Study of the properties of elastic foundations and the application of the elastic foundation theory to the analysis of large diameter, low head tanks, hemispherical domes, hemispherical headers on large pipes, and thin shell pipes under flexure.

288. **Applied Soil Mechanics.** Second term. Credit three hours. Prerequisite, 287 or its equivalent.

Advanced application of soil mechanics, based on the principles and physical studies of course 287. The plastic flow theory; the consolidation theory; stability of earth slopes; flow of water through earth structures; theories of earth pressure on retaining walls, caissons, and tunnels. Review of modern soil mechanics research.

291 (f). **Structural Engineering Design.** Either term. Prerequisites, 270, 271, and 280. Professor URQUHART and Associate Professor BURROWS.

The student may select a problem such as the following: (a) an arch bridge of steel, (b) a cantilever bridge, (c) a rigid frame bridge, (d) a special problem in steel or concrete building design, (e) the design of any other structure of particular interest to the student provided he has had the proper preparation for such design. The work is submitted in the form of reports. Drawings of typical details must accompany reports.

297 (f). **Research in Structural Engineering.** Second term. Professor URQUHART.

Students wishing to pursue one particular branch of bridge engineering further than can be done in any of the regular courses may elect work in this field. The prerequisite courses depend upon the nature of the work desired. The work may be in the nature of an investigation of existing types of construction or theoretical work with a view to simplifying present methods of design or proposing new methods.

TOPOGRAPHIC AND GEODETIC ENGINEERING

Professors P. H. UNDERWOOD and L. A. LAWRENCE.

The preliminary training as a qualification for work in this department should include the equivalent of the regular undergraduate course in civil engineering,

including work in General and Practical Astronomy. A thorough training in Mathematics and Physics is desirable.

Graduate work for those interested in Topographic and Geodetic Engineering includes courses in Advanced Topographic Surveying, in Geodesy, Least Squares, Geodetic Astronomy, and in Photographic and Aerial Surveying. The Library of the School of Civil Engineering contains an extensive collection of reference books in the subjects mentioned. The surveying equipment of the School is also available for practice work.

For courses in Geodetic Astronomy see page 102.

182. *Elements of Field Astronomy.* Either term. Credit two hours. (Given in Department of Astronomy.)

211. *Advanced Surveying.* First term. Credit three hours.

213. *Summer Survey: Topographic, Hydrographic,* and *Geodetic Survey: Camp.* Five weeks during end of summer following sophomore year. Credit four hours.

214. *Mapping.* First term. Credit two hours.

215. *Problems in Adjustment of Observations.* First term. Credit one hour.

216. **Least Squares: Adjustment of Observations.** First term. Credit two hours. Prerequisites, Calculus and Physics. Professor UNDERWOOD. Two recitations and lectures a week as may be arranged.

The course is designed for students who have experimental investigations in view. Applications are made to problems in physics, astronomy, mechanics, hydraulics, surveying, etc., with some attention given to the derivation of empirical formulae.

217. **Advanced Topographic Surveying.** Second term. Credit two hours. Prerequisite, 213. Professor UNDERWOOD. Lectures, recitations, and assigned readings. Two hours a week.

Economics of surveying methods. Surveys for special purposes, such as extensive construction work; storage and distribution of water for irrigation; earth work on a large scale; lines of communication, topographic reconnaissance, etc.; photographic surveying.

218. *Geodesy and Geodetic Laboratory.* First term. Credit three hours. Prerequisites, courses 182 and 211. Professor UNDERWOOD. Lectures, reading, discussions, and laboratory work. Three periods a week.

A course for the consideration of special problems in geodetic work. Precise leveling, deflection of the plumb line, figure of the earth, use and investigation of geodetic instruments and apparatus such as circles, levels, micrometer microscopes, standards of length, thermometers, pendulums, magnetic apparatus, etc. Subject to arrangement to meet the special needs of students.

219. **Photographic and Aerial Surveying.** Second term. Credit three hours. Prerequisite, 211. Professor UNDERWOOD. Recitations, lectures, and collateral reading. Three hours a week.

The principles of photographic surveying; surveys with camera stations on the ground, including stereoscopic methods; aerial surveys and the making of maps from such surveys; ground control.

297 (i). **Research in Geodetic Engineering.** Either term. Credit three or more hours. Prerequisites will depend upon the line of work to be pursued. Professor UNDERWOOD.

Special problems in least squares, geodetic surveying, and photographic surveying as may be arranged.

HOME ECONOMICS

Courses offered in the College of Home Economics are numbered in accordance with the following plan: courses numbered below 300 are, in general, undergraduate courses; courses numbered 300 to 400 are for seniors and graduate students; courses numbered above 400 are for graduate students. The full description of the undergraduate courses, listed in italics, will be found in the *Announcement of the College of Home Economics*.

Unless otherwise noted all classes meet in Martha Van Rensselaer Hall.

ECONOMICS OF THE HOUSEHOLD AND HOUSEHOLD MANAGEMENT

Professors HELEN CANON, ELLA M. CUSHMAN, ALIDA S. HOTCHKISS, and DELPHA E. WIESENDANGER.

Approved Major and Minor Subjects (key to symbols on p. 41)

Economics of the Household and Household Management 1, 2, 4

Graduate students are accepted in all courses offered by the Department of Economics of the Household and Household Management. Graduate credit is given for work at a graduate level.

130. **Economic Conditions in Relation to the Welfare of Families.** Either term. Credit three hours. Professor CANON. T Th 11–12:30. Room 121. Fee, $2.50.

A course to help students understand the changes that have taken place in the economic welfare of families in this country, and some of the factors related to these changes. Production as it relates to economic welfare, the national income as it relates to family incomes, the significance of price in our economic organization, and changes in our economy occurring in wartime.

160. **Marketing Problems from the Consumer's Viewpoint.** Either term. Credit three hours. Assistant Professor ROLLINS. M W 11, F 11–1. Room 121. Fee, $5.

The contribution that can be made by an efficient marketing system toward a high level of consumption for our people. Quantity, quality, and variety of supplies available in relation to the level of living of the families of the country and to management in their homes. The various services performed in moving goods from the places where they are used, and the costs of these services. The rôle of prices in distribution. Buying practices of consumers as they bear on marketing costs. Problems in standardization of goods. The part that can be played by the government, business associations, and private agencies and organizations in improving marketing practices, and action that has been taken by these groups. Visits to several marketing agencies.

300. **Special Problems.** Either term. Credit and hours to be arranged individually. For students approved by the head of the department and the instructor in charge for independent, advanced work on a problem not dealt with by other courses in the department. Fee determined by the problem.

310. **Management in Relation to Family Living.** Either term. Credit three hours. Graduate students should consult the instructor before registering. Assistant Professor CUSHMAN and Miss MCKEEVER. First term, M 2, W F 2–4:20; second term, M 2 and T Th 2–4:20 or W F 2–4:20. Room G 19. Fee, $12, including transportation for trips.

For students who wish help in understanding the process of management and opportunity for study and practice of this process. Experience in recognizing and analyzing the students' own problems. Meetings in homes, schools, and community centers to see how certain families and groups of people manage differently, with the resources available, to achieve their individual purposes. Cooperation with families and other groups in the study of tasks. Development of trial work centers set up with portable equipment to help in determining the most

satisfactory way of performing these tasks in each individual case. Practice in the selection and use of source material in management. One all-day tour, time to be arranged.

320. **Management in Relation to Household Equipment.** Either term. Credit three hours. Prerequisites, Agricultural Engineering 10 or the equivalent, and Economics of the Household 310. Miss KNOWLES. M W F 9–11. Room G 19-A. Fee, $10, including transportation for trips.

The management involved in selection, care, use, and repair of household equipment. Variation in types and quality in relation to individual situations. Discussion with homemakers, manufacturers, distributors, engineers, and others. Trips to Ithaca homes where certain equipment is being used, to commercial agencies where various equipment will be demonstrated, and to factories.

330. **Management in Relation to Personal Finances.** Either term. Credit three hours. Mrs. KENNEDY. T Th 2–3:30. Room 121. Fee, $2.50.

The relation between financial management and other management problems: outside economic conditions as they bear on the management of personal finances; factors influencing real income; efforts that individuals can make toward attaining financial security; important considerations in a savings program and in an investment program; policies in borrowing, sources of credit, availability and charges of lending agencies; financial records and statements helpful in managing.

400. **Review of Research in Management.** First term. Credit two hours. For advanced students in home management. Prerequisite or parallel, Economics of the Household 310. Consult the instructor before registering. Associate Professor CUSHMAN. F 9–11. Room G 19. Fee, $2.

Evaluation of results and methods of research in management. Discussions with investigators in various phases of management. Individual work on special problems.

410. **Economic Problems of Families.** Second term. Credit two hours. Professor CANON. F 9–11. Room 108. Fee, $1. The instructor should be consulted before registering.

Analysis of a few outstanding contributions to economic thought related to this field. Examination of methods of research.

415. **Problems in the Distribution of Consumers' Goods.** Second term. Credit two hours. Prerequisite, Economics of the Household 160 or the equivalent. Consult the instructor before registering. Assistant Professor ROLLINS. F 2–4. Room 124. Fee, $3.

Analysis of some of the important problems in distribution. Practice in locating and using sources of data bearing on marketing problems. Discussion of contributions from research in marketing.

420. **Seminar.** Either term. Department Staff. T 4:15–6. Room 114.

FAMILY LIFE

Professors MARIE B. FOWLER, ETHEL B. WARING, LEMO D. ROCKWOOD, HELEN D. BULL, and *Assistant Professor* KATHERINE REEVES; Miss MARY FORD.

Approved Major and Minor Subjects (key to symbols on p. 41)

Family Life 1, 2, 4

Advanced study in family life may be built upon a background of teaching experience with young children, school children, youth or older young people, or adults; school supervision or administration; social or clinical work in a health, nutrition, or behavior clinic; or extension teaching or administration. Previous training should include courses in psychology, sociology, and family life.

The selection of courses for a degree will vary with the previous background of the candidate but will fall largely within three groups:

Basic courses in biology, sociology, and anthropology, psychology, and education;

Courses in the other areas of the field of Home Economics—foods and nutrition, textiles and clothing, housing and furnishing, home finance and management, and institutional management;

Graduate work in Family Life—Graduate study involves course work to supplement and extend the student's undergraduate experience; field work with families in their homes; conference and discussion groups; and research. Laboratory experience is provided in the nursery school in Martha Van Rensselaer Hall and in the Federal and Settlement Nurseries in Ithaca.

100. *The Home and Family.* Survey course. Either term. Credit two hours.
110. *Health of the Family.* First term. Credit three hours.
120. *Home Nursing.* Either term. Credit one hour.
130. *Experience with Children.* Either term. Credit two hours.
140. *Creative Materials in Child Development.* Second term. Credit three hours.
150. *Children's Literature.* Second term. Credit two hours.
210. *Principles of Child Guidance.* Either term. Credit three hours.
260. *Family Relationships and Personality Development.* First term. Credit three hours.
270. *Marriage.* Second term. Credit three hours.

300. **Special Problems.** Either term. Credit and hours to be arranged individually. For students approved by the head of the department and the instructor in charge for independent, advanced work on a problem not dealt with by other courses in the department. Fee determined by the problem.

330 a, b, c. **Participation in the Nursery School.** Either term. Sections: **a. Junior Nursery School; b. Senior Nursery School; c. Federal and Settlement Nursery Schools.** Credit three or four hours each section. Open to a limited number of seniors and graduate students by permission of the instructor. Prerequisite or parallel, Family Life 210. Family Life 140 strongly advised. Laboratory hours will be arranged individually, thirty for each hour of credit, or distributed throughout the term. Professor FOWLER, Assistant Professor REEVES, and Miss OLESON. Conference hour for each section with the teaching staff as follows: **a.** T 12. Room 301. **b.** T 12. Senior Nursery School. **c.** Time and place to be arranged. Fee, $7.50 for each section.

Observation and study of young children in their homes and in the Nursery School. Participation in their care and guidance. Some experience in planning a child-activity program and in cooperating with staff and parents concerned.

[340. **Principles of Child Guidance, Advanced Course.** Second term. Credit three hours. Prerequisite, Family Life 210. Professor WARING. Given in alternate years, not in 1942–43.]

Observations of the behavior and guidance of young children, and analysis of narrative records for trends in the personality which indicate the conditions under which guidance may be effective.

350. **Seminar—Child Guidance.** (Rural Education 228.) Second term. Credit two hours. Prerequisite, some work in Family Life. Professor WARING. F 4–6. Room G-58. Given in alternate years. Offered in 1942–43.

400. **The Home and the Family Life.** Advanced Course. Graduate section of course 100. First term. Credit three hours. Open to graduate students with adequate training in Family Life. Attendance at lectures and discussions of Family Life 100. Professor FOWLER and Miss WOODRUFF. T Th S 9. Amphitheatre. Fee, $5.

A course planned to give advanced students some experience in developing a simple organization of the various areas of home economics subject matter around the central theme of the life of the family in the home.

405. **Elementary Methods and Techniques of Research in Child Development and Family Life.** First term. Credit two hours. Open to graduate students by permission of the instructor. Miss FORD. Hours to be arranged. Inquire Room G-29. Fee, $3.

Orientation in the sources of research material in Child Development and Family Life. Readings in current literature. Survey of experimental methods with

particular attention to the conditions underlying the effective use of each method. Consideration of elementary statistical technics in terms of the use and interpretations.

410. **Principles of Child Guidance.** Graduate section of course 210. Either term. Credit three hours. Open to qualified graduate students. Professor WARING. Lecture and discussion, M W F 8. Room 121. Observation in the Nursery School. Fee, $5.

Application of psychology to the understanding of the behavior of young children and to the working out of principles of guidance. Detailed study of an individual child in the Nursery School.

430. **Research in Family Life.** Either term. Professors WARING and ROCKWOOD and Miss FORD. For graduate students who are actively engaged in research or in special studies in Family Life. Credit will vary according to the nature of the problem.

[440. **Seminar—The Family.** Either term. Credit two hours. Not given in 1942–43.]

460. **Family Relationships and Personality Development.** First term. Credit three hours. Professor ROCKWOOD. M W F 9 or 11 and T 2–4. Room 124.

In addition to attending the undergraduate class sessions of Family Life 260 on M W F graduate students will meet separately for two hours weekly. Fee, $5.

This course aims to help the student understand how personality development takes place in the family setting and the ways in which each member of the family relates himself to the family experience at each stage of his development.

470. **Marriage.** Second term. Credit three hours. Professor ROCKWOOD, Dr. BULL and Mrs. PEABODY. M W F 9 or 11 and T 2–4. Room 124. In addition to attending the undergraduate class sessions on M W F graduate students will meet separately for two hours weekly. Fee, $5.

The individuality of the marriage relationship; affectional maturity and its relation to dating, courtship, mate-choosing, engagement and marriage adjustment; achievement of heterosexuality; predicting success or failure in marriage; legal qualifications; hereditary and health factors; sexual adjustment; fertility and sterility; child spacing; marriage interaction; financial planning and economic adjustment; woman's ambitions and marriage adjustment; physical, psychological and economic aspects of pregnancy and childbirth; the coming of the child and the family routine.

FOODS AND NUTRITION AND INSTITUTION MANAGEMENT

Professors HELEN MONSCH, MARION PFUND, HAZEL HAUCK, FAITH FENTON, KATHERINE HARRIS, ALICE BURGOIN, L. A. MAYNARD, and C. M. MCCAY; and Assistant Professor HATHAWAY.

Approved Major and Minor Subjects (key to symbols on p. 41)

Foods and Nutrition 1, 2, 3, 4
Nutrition 1, 2, 3, 4
Foods 2, 3, 4
Institution Foods 2, 4

As a basis for graduate work in foods and nutrition, elementary courses in the various divisions of Home Economics and courses in inorganic and organic chemistry are expected. A knowledge of quantitative chemical analysis, biological and physical chemistry, physiology, bacteriology, and physics is highly desirable.

Before applying for admission to the Graduate School a prospective student is advised to communicate with a member of the faculty in that field of foods and nutrition in which she wishes to do research: Foods, Professor PFUND, Associate Professor FENTON; Human Nutrition, Professors MONSCH or HAUCK or Assistant Professor HATHAWAY; Institution Foods, Professor HARRIS or Associate Professor BURGOIN.

Animal Nutrition, see p. 80.

Foods and Nutrition

100. *Food Preparation in Relation to Meal Planning.* Second term. Credit three hours.

110. *Science Related to Food Preparation.* Throughout the year. Credit five hours each term.

130. *Nutrition.* Either term. Credit three hours.

190. *Nutrition and Health.* First term. Credit one hour.

200. *Meal Planning and Preparation.* Either term. Credit three hours.

210. *Food Preparation: Principles and Comparative Methods.* First term. Credit four or five hours depending on whether organic chemistry has been taken as a background.

230. *Nutrition.* Second term. Credit five hours.

240. *Food Preparation, Advanced Course.* Second term. Credit three hours.

300. **Special Problems.** Either term. Credit and hours to be arranged individually. For students approved by the head of the department and the instructor in charge for independent, advanced work on a problem not dealt with by other courses in the department. Fee determined by the problem.

305. **Food Demonstrations.** First term. Credit one hour. Registration with permission of the instructor. Mrs. Foster. F 8–10:30. Room 361. Fee, $10.

A course emphasizing the purposes and technics of demonstrations in relation to food preparation and nutrition, with application to teaching, extension, business, and social service.

310. **Science Related to Foods, Advanced Course.** Throughout the year. Credit for lectures two hours a term. (Laboratory by recommendation of the department; credit one to three hours a term.) An adaptation of the material of Foods and Nutrition 110 for graduate students and certain students with advanced standing from other institutions. Attendance at Foods and Nutrition 110 lectures required. One additional hour and laboratory to be arranged. Professor Pfund. M W F 9. Amphitheatre. Fee, $2 for lectures, $5 for each laboratory credit hour.

A study of the scientific principles necessary to the understanding of modern theory and practice in the field of food preparation, and the application of these principles to the analysis and interpretation of cookery practices.

320. **Experimental Cookery.** First term. Credit three hours. Prerequisites, Foods 110 or 210, and 100, 200 or 240 or the equivalent. Consult the instructor before registering. Miss Miller. Lecture, W 8. Room 343. Laboratory, M F 8–11. Room 358. Fee, $10 or more depending upon the nature of the problem.

Independent laboratory work in the solving of practical problems in food preparation. Study of methods and technics used in experimental work in foods. Judging of food products. Written reports organizing and critically analyzing experimental results are required.

330. **Diet Therapy.** First term. Credit two hours. Advised for those specializing in hospital dietetics. Prerequisites, Foods and Nutrition 230 or 130, and 110 or 210, Human Physiology 303, and Biochemistry 314. Professor Hauck. Lecture, discussion, and laboratory, T 11; Th 11–1. Room 426. Fee, $6.

A study of diet in those diseases such as fevers, gastro-intestinal disturbances, and diabetes, in the treatment of which choice of food is important.

340. **Family Nutrition, with Special Emphasis on Child Feeding.** Either term. Credit for lectures, two hours; for each laboratory, one hour. Any laboratory may be taken either in the same term with the lecture or in any term following the lecture. Three hours advised for teachers; two hours advised for all students. Prerequisite, Foods and Nutrition 130 or 230. Professor Monsch and Mrs. Watson. Lecture and discussion, T 2–4. Room 339.

Laboratories: **infant feeding,** limited to twenty students, Th 2–4:20, Room 426; **feeding of pre-school children,** limited to ten students in each section, W 10–12:20 or 2–4:20. Room 301; **feeding of school children,** limited to ten students, F 2–4:20, Room 301. Fee, $7 for each laboratory credit hour; $1 for lecture.

A study of family nutrition, with special emphasis upon the nutritional needs of the child. Relation of nutrition to physical growth and development. Experience

in actual family situations, through private homes, the well-baby clinic, the Nursery School, and the public schools.

400. **Nutrition, Advanced Course.** Credit two hours. Registration by permission of instructor. Professor HAUCK. Discussion, T Th 9. Room 301. Fee, $1.

This course emphasizes the experimental data on which the principles of human nutrition are based, and a critical review of current literature in this field.

410. **Research in Foods and Nutrition.** Either term. For graduate students with training satisfactory to the instructor. Professors MONSCH, MAYNARD, MCCAY, PFUND, and HAUCK, and Associate Professor FENTON, and Assistant Professor HATHAWAY. Hours to be arranged. Fee, from $5 to $25.

Individual research in foods, human nutrition, and animal nutrition.

420. **Seminar in Foods and Nutrition.** Either term. Emphasis on foods first term, nutrition second term. Credit one hour each term. Required of graduate students specializing in Foods and Nutrition. Professors PFUND and HAUCK, Associate Professor FENTON, and Assistant Professor HATHAWAY. Hours to be arranged. Room 301. Fee, $1.

Note: The attention of advanced and graduate students is called to the following courses offered by the Department of Animal Husbandry in the College of Agriculture (see the announcement of courses of that college): 110, **Animal Nutrition;** 111, **Animal Nutrition, Laboratory Course;** 215, **Advanced Nutrition;** 219, **Animal Nutrition Seminar.**

INSTITUTION MANAGEMENT

100. *Institution Food Service.* Either term. Credit two hours.

220. *Food Selection and Purchase for the Institution.* Either term. Credit three hours.

230. *Quantity Food Preparation: Principles and Methods.* Either term. Credit five hours.

240. *Tea Room and Cafeteria Accounting.* Either term. Credit three hours.

300. **Special Problems.** Either term. Credit and hours to be arranged individually. For students approved by the head of the department and the instructor in charge for independent, advanced work on a problem not dealt with by other courses in the department. Fee determined by the problem.

310. *Institution Organization and Administration, Elementary Course.* First term. Credit three hours.

320. *Institution Organization and Administration, Advanced Course.* Second term. Credit three hours.

330. *Quantity Food Preparation and Catering, Advanced Course.* Either term. Credit four hours.

340. *Restaurant Cost and Sales Analysis.* Second term. Credit two hours.

400. **Research in Institution Organization and Administration.** Throughout the year. For graduate students with training and experience satisfactory to the instructor. Professor HARRIS and Associate Professor BURGOIN. Hours to be arranged. Fee determined by the problem.

Individual research in the area in which the student is particularly interested. Food-control procedure, job analyses and specifications, experimentation and development of standardized procedures in food preparation and merchandising as applied to quantity production, determination of factors underlying operation and maintenance costs are suggestive of the fields in which there is vital need for research.

410. **Seminar in Institution Organization and Administration Problems.** Either term. Credit one hour. For graduate students with adequate training in institution management. Professor HARRIS. Fee. $1.

TEXTILES AND CLOTHING AND HOUSEHOLD ART

Professors BEULAH BLACKMORE, PAULINE W. FULLER, RUTH SCOTT, MURIEL BRASIE, GRACE MORIN, and DORA W. ERWAY.

Approved Major and Minor Subjects (key to symbols on p. 41)

Textiles and Clothing and Household Art 2, 3, 4

Graduate work for the Master's degree is offered in Textiles and Clothing and Household Art. Emphasis may be placed upon either Textiles and Clothing or Household Art.

TEXTILES AND CLOTHING

The work in Textiles and Clothing may emphasize either the economic side or the applied-art side of the subject.

100. *Introduction to Clothing Selection and Construction.* Either term. Credit two hours.

110. *Clothing Construction.* Either term. Credit three hours.

130. *Textiles: Clothing Fabrics.* Either term. Credit two hours.

200. *Fitting and Pattern Making, Flat-Pattern Work, Modeling.* Either term. Credit three hours. By permission of the department.

205. *Clothing of the Family.* Either term. Credit two hours.

210. *Dress Design.* Either term. Credit two hours.

220. *Commercial Clothing and Advanced Problems in Construction.* Either term. Credit three, four, or five hours.

235. **Science Related to Textiles.** Second term. Credit two hours.

300. **Special Problems.** Either term. Credit and hours to be arranged individually. For students approved by the head of the department and the instructor in charge for independent, advanced work on a problem not dealt with by other courses in the department. Fee determined by the problem.

310. **Household Textiles.** Either term. Credit two hours. Each section limited to twenty students. Professor BLACKMORE. T Th 9–11. Room 278. Fee, $10, covers transportation but not other expenses on trip. Estimated cost of materials, $2.

A study of the range in quality in household textiles and the methods of selecting the quality best suited to specific needs. Buying problems in the area of Household Textiles.

Technical information necessary for efficient buying. Identification of fibers and fabrics for properties which affect satisfactory use. Procedure and performance of standard and other physical tests will be evaluated. Specifications set up by various groups. Existing state laws governing the sale of certain household textiles.

A two-day trip to four or more manufacturing establishments to observe designing, weaving, making of certain household fabrics and methods used in preparing fabrics for the retail market. (First term, December; second term, May.)

320. **Problems in Buying Clothing.** Either term. Credit three hours. Assistant Professor FULLER. M W F 11–1. Room 216. Fee, $8, covers transportation but not other expenses on trips.

Buying practices of consumers, the selling practices of stores, the relationship between the two, and the management problems met by consumers in planning and choosing clothing best suited to their specific needs and desires. Other topics discussed are: the relationship of such factors as design, fashion, and construction to the quality and cost of merchandise; labels and trade marks now used for identifying differences in quality of fabric; services offered by retail stores, such as testing bureaus, consultant bureaus, and training of salespeople. Information now available to consumers will be evaluated.

400. **Dress Design. Advanced Course.** Second term. Credit three hours. Prerequisite, Textiles and Clothing 200 and 210, or the equivalent. Assistant Professor FULLER. T Th 2–5. Room 216. Laboratory fee, $5. Estimated cost of materials, $15–$25.

Advanced draping with emphasis on the experimental manipulation of fabric and the fine use of line, color, texture, and decoration in dress. Designs will be executed in cloth.

410. **Seminar in Textiles.** Either term. Credit one hour. Prerequisite or parallel, course 310. Professor BLACKMORE.

Open to graduate students by permission of the instructor. Hours to be arranged.

430. **Seminar.** Second term. Credit one hour by arrangement. Department staff. Room 216.

HOUSEHOLD ART

Before entering upon advanced work in Household Art the student should have had basic courses in color and design, house planning and house furnishing, family life and household management. Whether a student's preparation is adequate for advanced study can be determined only by special consideration of each case.

100. *Color and Design.* Either term. Credit two hours.

110. *Applied Design.* Either term. Credit two hours.

120. *Home Furnishing.* Either term. Credit three hours.

140. *House Planning.* Either term. Credit three hours.

150. *Housing from the Standpoint of Home Economics.* Second term. Credit two hours.

160. *Appreciation of Everyday Art. Painting and Allied Subjects.* First term. Credit one hour. Given in alternate years.

170. *Appreciation of Everyday Art. Applied Design.* First term. Credit one hour. Given in alternate years.

[180. *Appreciation of Everyday Art. Domestic Architecture.* First term. Credit one hour. Not given in 1942–43.]

[190. *Appreciation of Everyday Art. Interior Design.* Second term. Credit one hour. Not given in 1942–43.]

200. *Advanced Color and Design.* Second term. Credit two hours.

215. *Applied Design.* Either term. Credit two hours.

220. *Home Furnishing.* Either term. Credit three hours.

300. **Special Problems.** Either term. Credit and hours to be arranged individually. For students approved by the head of the department and the instructor in charge for independent, advanced work on a problem not dealt with by other courses in the department. Professor MORIN and members of Household Art Staff. Fee determined by the problem.

320. **Home Furnishing.** First term. Credit two hours. Registration on permission of the instructor. Professor MORIN, and Miss HUPP. M 2–4 and two additional hours to be arranged. Room 408. Fee, $7.50. Cost of materials and trips variable, minimum $3.

Continuation of Household Art 220. A broader and more detailed study of home furnishing, coordinating in advanced problems the principles developed in preceding courses. As fully as time permits, opportunity is given prospective teachers and extension workers to prepare demonstration material.

400. **Seminar.** Either term. Credit one hour. Time to be arranged. Department staff.

EDUCATIONAL LEADERSHIP IN HOMEMAKING

Assistant Professor GRACE M. HENDERSON.

Approved Major and Minor Subjects (key to symbols on p. 41)

Educational Leadership 2, 4.

These courses are designed for public school teachers of adults, extension workers, volunteer community leaders, nutritionists, public health and social workers, farm security supervisors, parent educators, home service workers, teacher- and leader-trainers, supervisors of homemaking programs, county leaders, members of program-planning and advising committees for homemaking

education on emergency and permanent bases, and others who lead in out-of-school educational programs in homemaking.

---

350. **Individual Problems.** Either term. Open to a limited number of students by permission of the instructor. Credit and hours to be arranged. Assistant Professor HENDERSON. Fee to be determined.

430. **Organization and Policies.** (Rural Education 134b, Adult Homemaking Education.) Second term. Credit three hours. Assistant Professor HENDERSON. Discussion, M W F 11, and to be arranged. Room 3M13. Field work and conferences require 45 hours outside of class time. Field work may be blocked by arrangement with the instructor. Fee, $5. Estimated expenses of trips, $8.

A study of extension, adult education through the public schools, and a few other public programs of out-of-school homemaking education; the principles, purposes, laws, and history underlying their present practices and policies; their resources and possible future developments; professional-leadership jobs within these organizations; ways they cooperate in planning programs, promoting interest, developing lay leaders, and sharing resources and responsibilities in administration and teaching. Observation of out-of-school teaching, administrative activities, offices, and equipment, and conferences with professional and lay leaders near Ithaca.

440. **Program Planning and Methods.** (Rural Education 134c, Adult Homemaking Education.) First term. Credit three hours. Assistant Professor HENDERSON. Open to a limited number of upperclass and graduate students, preferably those who have had Leadership 330 or comparable experience. Enrollment by permission of the instructor. Discussion, M W F 11, and to be arranged. Room 3M13. Field work and conferences require 45 hours outside of class time. Field work may be blocked by arrangement with the instructor. Fee, $5. Estimated expenses of trips, $8.

An opportunity for each student to lead a community group in planning and carrying through a program of homemaking improvement. Personal conferences, group discussion, and independent analysis of her own and observed teaching will aid the student in clarifying and attacking her own problems in adult leadership. Observation of, participation in, and conferences with professional leaders of adult classes near Ithaca. Evaluation of existing programs and teaching procedures in relation to purposes. Discussion of principles of learning, factors and procedures in program building, the development of lay leaders, and problems and educational needs of families.

HOTEL ADMINISTRATION

Professors H. B. MEEK, F. H. RANDOLPH, LOUIS TOTH, A. L. WINSOR, JOHN COURTNEY, C. I. SAYLES, and C. E. CLADEL.

Approved Major and Minor Subjects (key to symbols on p. 41)

Hotel Management 2, 4
Hotel Accounting 2, 4

Note. A major or minor subject may be selected in the field of Hotel Administration provided the other subject is taken outside the department of Hotel Management and has the approval of the Dean of the Graduate School.

Graduate work for the Master's degree is offered in Hotel Administration. A foundation knowledge of hotel management is required of graduate students majoring in the field. Such students will choose a minor in a related or underlying field such as accounting, statistics, engineering, or one of the social sciences. Students majoring in the latter fields may find in the problems of the hotel industry a fertile field for research.

Through its contacts with the American Hotel Association and its subsidiary associations and with member hotels the University has possession of and access to a wide range of research material.

81 and 82. *Accounting.* Throughout the year. Credit eight hours.

114. *Psychology for Students of Hotel Administration.* First term. Credit three hours.

181 and 182. *Hotel Accounting.* Throughout the year. Credit six hours.

183. *Auditing.* First term. Credit three hours.

184. *Food and Beverage Control.* Second term. Credit three hours.

187. *Tax Computation.* First term. Credit two hours.

240. *Tea Room and Cafeteria Accounting.* First or second term. Credit three hours.

[281. **Budgeting.** Second term. Credit two hours. Not given in 1942–43.]

282. *Accounting Practice.* First term. Credit three hours.

283. *Advanced Accounting.* Second term. Credit three hours.

284. *Problems in Food Control.* Second term. Credit one hour.

288. *Accounting Machines in Hotels.* First or second term. Credit one hour.

340. *Restaurant Cost and Sales Analysis.* Second term. Credit two hours.

151. *Hotel Operation.* First term. Credit two hours.

160. *Hotel Engineering Fundamentals.* First term. Credit four hours.

161. *Mechanical Service Applications.* Second term. Credit four hours.

162a. *Steam Power and Heating, Lectures.* First term. Credit two hours.

162b. *Steam Power and Heating, Laboratory.* First term. Credit two hours.

163a. *Refrigeration and Electrical Equipment, Lectures.* Second term. Credit two hours.

163b. *Refrigeration and Electrical Equipment, Laboratory.* Second term. Credit two hours.

164. **Hotel Planning.** First term. Credit two hours. Prerequisite, Hotel Engineering 161. Open to a limited number of seniors and graduate students with the consent of the instructor. Professor RANDOLPH. T Th 9–10:30. East Roberts 223. Fee for materials, $3.

Planning the layout for a proposed hotel, emphasizing floor plans and selection and arrangement of the equipment in various departments, including the kitchen and the laundry.

165. **Hotel Engineering Problems.** Second term. Credit one hour. Prerequisites, Hotel Engineering 162a and 163a and consent of the instructor. Professor RANDOLPH. T Th 10. East Roberts 223.

The discussion and solution of practical problems involving the selection, use, and revision of mechanical and electrical equipment in hotels. Cases are based on actual problems encountered. Costs are given primary consideration.

166a. **Hotel Structures and Maintenance,** Lecture. Second term. Credit two hours. Prerequisite, mechanical drawing. Assistant Professor SAYLES. T Th 11. East Roberts 222. Materials fee, $1.

Materials and methods of building construction; specification and repair of furniture; the usual methods employed by the trades in the alteration of hotel structures.

166b. **Hotel Structures and Maintenance,** Laboratory. Second term. Credit one hour. Hotel elective with consent of instructor. Taken with or after 166a. Assistant Professor SAYLES. Laboratory fee, $5.

Laboratory construction of typical building elements, emphasizing problems of repair, maintenance, and decoration.

167. **Building Costs.** Second term. Credit one hour. Prerequisite, Hotel Engineering 166a. Assistant Professor SAYLES. Th 1:40–4. East Roberts 223.

The customary procedure in estimating various building costs for construction, alteration, repair, and decoration.

185. **Hotel Accounting Problems.** Second term. Credit two hours. Prerequisite, Hotel Accounting 183 or its equivalent. Assistant Professor COURTNEY and Mr. FOX. W 11–1. West Bailey.

Incorporating the hotel owning and operating companies. Financing bond issues and discounts. Accounting provisions in hotel leases and management contracts. Installation of hotel accounting systems.

186. **Interpretation of Hotel Financial Statements.** Second term. Credit two hours. Prerequisite, Hotel Accounting 183 or its equivalent. Assistant Professor COURTNEY and Mr. FOX. W 1:40–4. Warren 201.

Study and discussion of hotel balance sheets and profit and loss statements. Typical balance sheets and operating ratios of representative hotels.

189. **Problems in Analysis and Interpretation.** First or second term. Credit two or three hours, depending on work done. Registration limited. Assistant Professor COURTNEY. Martha Van Rensselaer G-1. Fee for materials, $3.

A seminar course for graduate students or seniors in hotel administration. Application of statistical methods to problems in analysis and interpretation. Each student will solve one or more problems.

153. **Seminar in Hotel Administration.** Second term. Credit two hours. Prerequisite, Hotel Administration 151 or its equivalent. Registration limited. Professor MEEK. Hours to be arranged.

A course devoted to the study of specific problems arising in the management of hotels.

119. **Personnel Administration in Hotels.** Second term. Credit three hours. Prerequisite, Rural Education 114 or its equivalent. Professor WINSOR. M W F 8. Plant Science 233.

Study of the problems of human relations in industry. Methods and problems of recruitment, selection, placement, maintenance, organization, and government of employees are analyzed with particular reference to the hotel industry.

219. **Seminar in Personnel Administration.** Second term. Credit two hours. Prerequisite, 119. Professor WINSOR. Th 4:15–6. Warren 340.

An analysis of current problems in personnel administration.

LAW

Professors of Law R. S. STEVENS, L. P. WILSON, G. J. THOMPSON, H. E. WHITESIDE, G. H. ROBINSON, H. D. LAUBE, W. H. FARNHAM, J. W. MACDONALD, L. W. MORSE, A. J. KEEFFE, G. T. WASHINGTON, and D. G. YORKEY.

The Division of Law consists of the members of the Faculty of Law, representatives of the associated departments of Economics, Government, History, and Philosophy in the College of Arts and Sciences, Professors DONALD ENGLISH, R. E. CUSHMAN, M. L. W. LAISTNER, and G. W. CUNNINGHAM, and such other members of the Graduate School Faculty as for the time being are serving on the special committees of candidates for the graduate degrees in law.

Approved Major and Minor Subjects (key to symbols on p. 41)

Jurisprudence 1, 2, 3, 4
Legal History 1, 2, 3, 4
Private Law 1, 2, 3, 4
Procedure 1, 2, 3, 4
Public Law 1, 2, 3, 4

Graduate work in law is organized under the direction of the Division of Law of the Graduate School, in which is vested authority to establish and administer rules for admission to candidacy for, and graduation with, the degrees LL.M. and J.S.D.

This method of organizing graduate work in law is considered especially advantageous since it offers to graduate students in law an opportunity to correlate their work in law with work in allied fields in other departments of the University, such as those in philosophy, history, government, business, and finance.

Candidates for either of the graduate degrees in law must be in residence not less than one academic year.

The Master's degree is intended primarily for those who desire to increase their knowledge of the law by intensive work in special fields.

Work leading to the Doctor's degree is designed to train legal scholars and to stimulate original investigation in the purpose, administration, history, and progress of the law. It is expected that candidates for the Doctor's degree shall have had some professional practice or teaching experience after obtaining a first degree in law.

A number of furnished offices are provided in the Law School building, Myron Taylor Hall, for graduate students in law.

Seminar courses in law will be given when the election by suitable groups is indicated. Advanced courses in associated fields also may be required or approved. Directed research will be arranged with the approval of the Division.

For the procedure to be followed by a candidate for LL.M. see p. 20 of this Announcement, and for J.S.D. see p. 27.

For more detailed information regarding graduate work in law and description of courses see the current *Announcement of the Law School.*

50. **Jurisprudence.** First term. Two hours. Professor LAUBE. Required for all graduate students in law and elective for other graduate students. Assigned reading and selected cases.

An examination of the nature and end of law, its sources, its forms, its scope, its application, and its growth.

The following courses are elective for graduate students:

51. **Administrative Law.** First term. Two hours. Professor WHITESIDE.

53. **Problems in Jurisprudence.** Second term. One hour. Professor LAUBE.

54. **Problems in Taxation.** Second term. Two hours. Professors STEVENS and WHITESIDE.

55. **Directed Studies in Legal History.** Professors WHITESIDE, THOMPSON, and ROBINSON, and Associate Professor WASHINGTON.

57. **Problems in Federal Practice.** Second term. Two hours. Associate Professor KEEFFE.

58. **Seminar in Election of Remedies.** First term. Two hours. Professor WILSON.

60. **Seminar in Business Regulation III.** —— term. One hour. Prerequisite, Constitutional Law, Business Regulation I, or a course in the Law of Public Utilities. Associate Professor WASHINGTON. Seminar based on assigned material and research reports.

61. **Problems in Trusts and Estates.** Second term. Two hours. Professor WHITESIDE.

62. **Seminar in Legislation.** First term. Two hours. Professor MACDONALD.

63. **Directed Studies in Procedure.** Professors MACDONALD and WILSON, and Associate Professor KEEFFE.

80. **Administrative Problems in Business Regulation.** Second term. Two hours. Professor MACDONALD.

VETERINARY MEDICINE

Approved Major and Minor Subjects (key to symbols on p. 41)

Animal Pathology 1, 2, 3, 4
Animal Physiology 1, 2, 3, 4
Diseases of Large Animals 1, 2, 3, 4
Diseases of Small Animals 1, 2, 3, 4
Immunology 1, 2, 3, 4
Pathogenic Bacteriology 1, 2, 3, 4
Pharmacology 1, 2, 3, 4
Poultry Diseases 1, 2, 3, 4
Veterinary Anatomy 1, 2, 3, 4
Veterinary Obstetrics 1, 2, 3, 4
Veterinary Parasitology 1, 2, 3, 4
Veterinary Surgery 1, 2, 3, 4

ANIMAL BREEDING, HUSBANDRY, NUTRITION

See under ANIMAL SCIENCES, p. 78.

VETERINARY ANATOMY

Professors EARL SUNDERVILLE and MALCOLM E. MILLER.

The laboratories of the department are well equipped for classwork and research. In the regular courses offered, the anatomy of the domestic animals is given.

The following courses are open to graduate students. For details of subject matter, see the *Announcement of the New York State Veterinary College.*

1. *Comparative Osteology.* Second term. Three hours.
2. *Arthrology.* Second term. One hour.
3. *Myology and Viscera.* Second term. Three hours.
4. *Myology, Thoracic, and Abdominal Viscera, Lymphatic System, and Organs of Special Sense.* First term. Six hours.
5. *Blood Vessels and Nerves of the Arm, Leg, and Head.* Second term. Five hours.
6. *Canine Anatomy.* First term. One hour.

PHYSIOLOGY

Professors H. H. DUKES, C. E. HAYDEN, and J. A. DYE.

The laboratories of the department are well equipped for research work in physiology. Adequate facilities are available for work in both the experimental and the chemical fields. The Flower Library, in James Law Hall, provides a good collection of periodicals and books on physiology and related subjects. These may be supplemented by the many works on physiology in other libraries of the University.

Graduate students who plan to do their major work in physiology must have had the basic subjects of the department or their equivalents. Graduate students who plan to do minor work in physiology may undertake special problems or research work if they are qualified, or they may pursue work in the regularly scheduled courses of the department.

10. *Animal Physiology.* Either term. Credit three hours.
11. *Chemical Physiology.* First term. Credit four hours.
12. *Physiology of the Domestic Animals.* First term. Credit three hours.
13. *Physiology of the Domestic Animals.* Second term. Credit three hours.
14. *Experimental Physiology.* Second term. Credit three hours.
15. *Applied Chemical Physiology.* Second term. Credit two hours.
303. *Human Physiology.* Either term. Credit three hours.

16. **Advanced Experimental Physiology.** First term. Credit three hours. Prerequisites, 12 or 13, or the equivalent, and 14 and 15, or their equivalent. Registration by permission. Professor DUKES and Associate Professor DYE. F 9–1. A conference hour to be arranged. Laboratory fee, $10.

A laboratory course in mammalian and avian physiology.

17. **Special Problems in Chemical Physiology.** Both terms. Registration by permission. Professor HAYDEN. Hours to be arranged. Laboratory fee, $2 a credit hour.

This course will be adapted to the needs of students and will consist of laboratory work, conferences, collateral readings, and reports.

305. **Endocrinology and Metabolism.** First term. Credit three hours. Prerequisite, six or more hours each of biology and chemistry. Associate Professor DYE. M W F 8. Moore Laboratory 101.

306. **Laboratory in Physiology.** Second term. Credit three hours. Registration by permission. Associate Professor DYE and assistants. James Law Hall.

Selected experiments to parallel course 305. Laboratory, M F 1:40–4. Discussion period, W 4:15. Laboratory fee, $10.

18. **Research.** Both terms. Hours to be arranged. Professors DUKES, HAYDEN, and DYE.

ANIMAL PATHOLOGY, BACTERIOLOGY, AND IMMUNOLOGY

(See also under BACTERIOLOGY, p. 94)

Professors W. A. HAGAN, PETER OLAFSON, E. L. BRUNETT, A. ZEISSIG, C. W. BARBER, and P. P. LEVINE.

The laboratories of pathology and bacteriology are well equipped with apparatus for research in pathological anatomy, pathogenic bacteriology, and immunity. The department operates two diagnostic laboratories to which a great deal of pathological material comes. A variety of fresh material is thus made available for study. The Flower Library, in James Law Hall, has a very complete set of current periodicals, and the more important books and monographs dealing with the work of the department is available.

Candidates for advanced degrees, electing pathology or bacteriology as their major subjects, must have had at least the corresponding general subjects given in this department, or their equivalents. Candidates electing a minor subject in this department may take up a research problem, if they possess sufficient preliminary training, or may pursue regular undergraduate course work, the courses taken being subject to the approval of the staff member who is in charge of the minor.

The following courses are open to graduate students. For additional information, see the *Announcement of the New York State Veterinary College.*

40. *General Pathology.* Second term. Two hours.
40a. *General Pathology Laboratory.* Second term. Two hours.
41. *Special Pathology.* First term. Two hours.
41a. *Special Pathology Laboratory.* First term. Two hours.
42. *Pathology of Infectious Diseases.* First term. Two hours.
43. *General Bacteriology.* Second term. Two hours.
43a. *General Bacteriology Laboratory.* Second term. Two hours.
46. *Diseases of Poultry.* First term. Two hours.
48. *Food Hygiene.* First term. Two hours.
49. *Pathogenic Bacteriology and Immunity.* First and second terms. Two hours.
49a. *Pathogenic Bacteriology Laboratory.* First term. Three hours.
149. *Pathogenic Bacteriology Laboratory.* Second term. Two hours.

[151. **Immunological Methods.** Prerequisites, 49, and 49a or 149. Professor ZEISSIG. Class limited to twelve students. T Th 1:40–4. Laboratory fee, $10. Not given in 1942–43.]

152. **Advanced Work in Pathology and Bacteriology.** For students who have completed the undergraduate courses in pathology and bacteriology. Professors

HAGAN and OLAFSON. Special problems or assignments will be given. Hours to be arranged. Laboratory fee, $2 a credit hour.

153. *Hematology.* First term. One hour.

154. **Seminar.** First and second terms. One hour, time to be arranged. Required of all graduate students.

(For dairy bacteriology, see Dairy Bacteriology; for soil bacteriology, see Agronomy.)

DISEASES OF BREEDING CATTLE
(Also includes VETERINARY PARASITOLOGY)

Professors R. R. BIRCH, H. L. GILMAN, and D. W. BAKER.

The department maintains a herd of cattle to be used in research with diseases that interfere with reproduction. Ample facilities are at hand for the study of the clinical and laboratory aspects of this group of diseases, and special research problems are being worked out at all times. Excellent facilities are also available for investigation of parasitological problems.

The following courses are open to graduate students. For additional information, see the *Announcement of the Veterinary College.*

62. *Animal Parasitology.* Second term. Two hours.

62a. *Parasites Laboratory.* Second term. One hour.

63. **Advanced Work in Animal Parasitology.** Either term. Professor BAKER. Hours by arrangement.

Special problems with the parasites of animals.

VETERINARY PHARMACOLOGY AND DISEASES OF SMALL ANIMALS

Professors H. J. MILKS and H. C. STEPHENSON.

The laboratories of the department are well equipped for research in veterinary pharmacology. The clinic supplies abundant material for research both in external and internal diseases of small animals.

There is an operating room with modern equipment and facilities for handling approximately sixty animals. The library facilities are good.

20. *Pharmacology.* First term. Four hours.

21. *Materia Medica and Pharmacy.* First term. Two hours.

22. *Diseases of Small Animals.* Second term. Two hours.

22a. *Diseases of Small Animals.* Second term. Two hours.

23. *Recitations in Materia Medica and Therapeutics.* Second term. Two hours.

24. **Advanced Work.** This course will consist principally of the study of the action of drugs upon well and sick animals, and of the diseases of small animals. This will be supplemented by collateral reading and reports.

25. *Small Animal Clinic.* Six actual hours a week.

VETERINARY MEDICINE, AMBULATORY CLINIC, AND OBSTETRICS INCLUDING DISEASES OF THE GENITAL ORGANS

Professors M. G. FINCHER, W. J. GIBBONS, and S. J. ROBERTS.

Opportunity for the clinical study of internal diseases of animals is afforded by material in the ambulatory clinic. This clinic has gradually developed until it demands a large part of the time of two clinicians. Especially abundant are affections of dairy animals. Students are required to report their observations. Files of notes on completed cases are available for additional information. Special and research students will be given individual instruction to meet their requirements, and may supplement their clinical experience with further study in the various laboratories and museums of the College.

VETERINARY SURGERY

Professors J. N. FROST and A. G. DANKS.

The laboratory in surgery is well equipped for research and special study along surgical lines especially in connection with diseases of bones, tendons, and tendon sheaths.

Candidates for advanced degrees should have as preliminary preparation, general pathology, physiology, general and special surgery.

32. *Special Surgery.* First term. Five hours. Professor FROST.

Research in Surgical Diseases. Professor FROST.

THE MEDICAL SCIENCES

AS PRESENTED IN THE MEDICAL COLLEGE IN NEW YORK CITY

The Graduate Faculty of the Medical College (Group F of the Graduate School) at present consists of professors in the preclinical branches of medicine who accept properly qualified students as candidates for the higher academic degrees. The qualifications required of graduate students are in every particular those which are required of students in other divisions of the University. Students desiring to enter the Graduate School for work in the medical sciences can obtain application blanks at the office of the Dean of the Medical College. Professor C. V. Morrill, Chairman of the Group, may be consulted for additional information. Since the number of graduate students who can be accommodated is limited, a personal interview is required of all applicants *before the filing of forms.* For a description of the work in the Medical College in New York City, see the *Announcement of the Medical College.*

The Medical College in New York City now occupies a portion of the plant of the New York Hospital-Cornell Medical College Association. This new medical center is located on the bank of the East River north of the Rockefeller Institute for Medical Research. It occupies several city blocks extending from the East River on the east to York Avenue on the west, and from Sixty-eighth Street on the south to Seventy-first Street on the north.

The Medical College group consists of buildings in the western part of the plant, facing York Avenue, opposite Sixty-ninth Street. These buildings from north to south are occupied by the departments of Anatomy, Public Health, Bacteriology, Pathology, Physiology, Biochemistry, and Pharmacology. The library is located in the building of the Department of Pathology and at present contains about 25,000 volumes.

ANATOMY

Professors J. C. HINSEY, J. F. NONIDEZ, C. V. MORRILL, G. N. PAPANICOLAOU, and C. L. YNTEMA.

Abundant material and sufficient apparatus are available for advanced study and work in the various branches of anatomy: embryology, histology, descriptive and experimental anatomy, neurohistology, and experimental neurology. Students desiring to pursue graduate work in any of these branches must have had in their college courses preliminary training in general zoology and comparative anatomy. A reading knowledge of German and French is essential.

The courses offered for the medical students appear in the *Announcement of the Medical College,* and are particularly recommended to those students who have not pursued work of this kind. In addition, the members of the staff offer work in the various phases of anatomy in which they are especially engaged. Technical and practical anatomical work are fully provided.

The requirements for either a major or a minor in anatomy will be determined for each individual case by the department of Anatomy, after consultation with the authorized representatives of the other departments involved. As a prerequisite for graduate work in anatomy, each student will be expected to have a thorough training in the fundamental sciences of physics, chemistry, and biology such as is required for admission to the Medical College.

BACTERIOLOGY AND IMMUNOLOGY

Professors JAMES M. NEILL, JOHN Y. SUGG, and THOMAS P. MAGILL.

The course given to second-year students consists of lectures, laboratory work, and group conferences. Emphasis is placed upon the aspects of bacteriology and of immunology that are pertinent to an understanding of the etiology and pathogenesis of infectious diseases. The study of infectious material from patients is included in the laboratory part of the course, not only to acquaint the student

with the technical procedures but to illustrate the directness of application of the fundamental principles of the subject to the practical methods used in the examination of clinical material.

Graduates and special students. Opportunities for advanced study and for research will be offered to students particularly interested in bacteriology and immunology. Hours to be arranged.

BIOCHEMISTRY

Professors V. DU VIGNEAUD, W. SUMMERSON, and J. P. CHANDLER.

Opportunity is offered for advanced work and research in various phases of biochemistry. Adequate chemical and physical equipment and fundamental library facilities are provided for the investigation of a considerable variety of problems in the chemistry of the plant or the animal organism or of the human organism in health and disease.

Graduate students expecting to pursue investigations in biochemistry should have adequate preliminary training in inorganic, organic, analytical, and physical chemistry.

Students electing biochemistry as a minor subject are expected to complete the regular medical course in biochemistry, or its equivalent, as a minimum requirement.

PATHOLOGY

Professors WILLIAM DOCK, JACOB FURTH, GEO. M. HASS, G. B. MIDER, and J. A. SAXTON.

The departmental laboratories are suitably equipped for carrying on graduate study and research problems in Pathology. Since members of the staff are engaged in varied investigations concerning etiology and pathogenesis, the department offers wide opportunity for the experimental study of disease. Adequate facilities for the care of animals are available. There is a small departmental library where some of the current journals and reference books are kept on file. The main library is situated on the floor immediately beneath the department, and is readily accessible. There is a carefully culled collection of mounted museum specimens, in addition to an active file of preserved gross material for study. The histological collection is likewise unusually rich in material. Autopsies for the entire hospital are performed by the members of the department, and offer an opportunity for the study of fresh pathological tissues.

No regular course of study is offered by the department for graduate students, but applicants in this field are given abundant opportunity for special work under the direct supervision of a member of the department. Such work may include the investigation of some problem, and may be credited towards the applicant's graduate degree.

Preliminary requirements: Applicants who have been admitted to the Graduate School are required to present the equivalent of the first two years of medicine for admission to graduate work in the department.

PHARMACOLOGY

Professors MCKEEN CATTELL and HARRY GOLD.

Facilities are available for advanced work and research in both the chemical and pharmacodynamic aspects of pharmacology. In addition, arrangement can be made in special cases for correlating laboratory results with clinical studies. Special opportunities are afforded for the investigation of the action of drugs on the circulation, the autonomic nerves, and muscle. The department is well equipped with special apparatus, including electrocardiographs with amplifying system, and galvanometers with accessories for the measurement of small temperature changes such as are employed for the measurement of heat production in tissues.

An adequate preliminary training in chemistry and physiology is prerequisite for graduate work in pharmacology.

PHYSIOLOGY AND BIOPHYSICS

Professors EUGENE F. DU BOIS, DAYTON J. EDWARDS, WILLIAM H. CHAMBERS, JAMES D. HARDY, ROBERT F. PITTS, and CHARLES O. WARREN.

Graduate and research training is provided for students who wish to prepare themselves for teaching and research in the physiological aspects of biological science, with special emphasis on the physical and chemical approach; those who desire to prepare themselves more adequately for clinical practice and research by advanced training in some phase of physiology; and those who are entering a career in human biology.

Instruction is at first provided through the medium of formal basic courses in this and other departments of the Medical School, and in the departments of physics and chemistry of neighboring universities. This work is paralleled by similar courses which deal with specialized subjects on a more advanced level. Finally, the student is associated with various members of the staff on a tutorial basis for instruction in special research problems.

The laboratories are equipped for research in most fields of physiology and biophysics with special facilities for investigations in neurophysiology and metabolism. There is an excellent library in the department.

The Russell Sage Institute of Pathology, which houses the calorimeter in the New York Hospital, is under the direction of the head of this department.

PUBLIC HEALTH AND PREVENTIVE MEDICINE

Professors WILSON G. SMILLIE and MORTON C. KAHN.

The Department of Public Health and Preventive Medicine does not offer formal graduate courses in Public Health or in Preventive Medicine, and the University does not grant advanced degrees in Public Health. Candidates for the Ph.D. degree may, however, elect Parasitology as a major subject. Members of this department have all carried on investigational work in tropical countries and an excellent collection of living and preserved parasitic material is available for study and research.

The medical school courses in both Public Health and Parasitology are acceptable as minor requirements for students who may desire to major in other departments of the University. The department welcomes graduate students who wish to register in special fields. Each application will be considered on its merits, and the work may be arranged in accordance with the desires and purposes of the candidate after consultation with the members of the department.

The laboratories are well equipped for research in public health, epidemiology, serology, and parasitology. Facilities at the Kips Bay-Yorkville District Health Center are available to a limited number of graduate students for the study of certain social aspects of Preventive Medicine and Public Health.

It is preferred that the candidate for advanced work in the Department of Public Health and Preventive Medicine should have a medical degree; he should also possess credit for or the equivalent of the basic course in Public Health given to the third year medical students in Cornell.

THE AGRICULTURAL SCIENCES

AS PRESENTED IN THE NEW YORK STATE EXPERIMENT STATION AT GENEVA.
P. J. PARROTT, *Director*

Since July 1, 1923, the New York State Experiment Station at Geneva has been under the administration of Cornell University. Research workers on its staff are eligible for membership on the Faculty of the Graduate School, and its facilities for research are available to graduate students.

The station is equipped to care for graduate students in certain specific lines of research, viz., Bacteriology, Chemistry, Dairying, Economic Entomology, Plant Pathology, Pomology, Seed Investigations, and Vegetable Crops. Ample accommodations are available from the standpoint of laboratory facilities, reference library, etc., for research in the laboratory sciences. Greenhouses and also a farm of approximately 200 acres are available for work with fruits and vegetables, and a dairy herd is maintained for work with animals and to supply dairy products for experimental studies.

Certain phases of the investigations now being conducted at the Station and other problems for which the facilities of the Station are suitable may be used as thesis problems by graduate students.

Students who plan to do part of their graduate work at Geneva should correspond with the Dean of the Graduate School concerning special regulations as to residence credit, special committees, etc.

BACTERIOLOGY

Professors R. S. BREED, H. J. CONN, G. J. HUCKER, C. S. PEDERSON, M. W. YALE, and A. W. HOFER.

Members of this Division are engaged in a study of problems in fermentation, food bacteriology, fundamental physiological and taxonomic studies of bacteria, and applied dairy and soil bacteriology. Thesis problems may be selected in any of these fields as follows:

Dairy Bacteriology. Professors BREED and HUCKER.

Biological Stains. Professor CONN.

Food Poisoning. Professor HUCKER.

Food Packaging. Professor HUCKER.

Food and Fermentation Bacteriology. Professor PEDERSON.

Taxonomy of Bacteria. Professor BREED.

Cheese Ripening. Professor YALE.

Soil Bacteriology. Professors CONN and HOFER.

CHEMISTRY

Professors D. K. TRESSLER, A. W. CLARK, Z. I. KERTESZ, H. G. BEATTIE, L. B. NORTON, G. L. MACK, and G. W. PEARCE.

Opportunities for graduate research in the following fields are offered: the chemistry, technology of preservation, and nutritive values of fruits, fruit juices, vegetables, and other foods; plant enzymes; the chemistry of pectin; insecticides and fungicides; vitamins of animal feeds, and the chemistry and technology of wine manufacture.

Nutritive Value of Foods. Professor TRESSLER.

The Chemistry of Fruits and Vegetables. Professor TRESSLER.

The Preservation of Fruits and Vegetables. Professor TRESSLER.

The Technology of the Preservation of Fruit Juices. Professors TRESSLER and BEATTIE.

Vitamins of Animal Feeds. Professor CLARK.

Plant Enzymes. Professor KERTESZ.

The Chemistry of Pectin. Professor KERTESZ.

Insecticides and Fungicides. Professors NORTON and PEARCE.

Chemistry and Technology of Wine Manufacture. Professor TRESSLER.

DAIRYING

Professors A. C. DAHLBERG, D. C. CARPENTER, J. C. MARQUARDT, and J. C. HENING.

Advanced graduate work in the fields of chemistry and technology of ice cream manufacture, chemistry of proteins, dairy chemistry, factors controlling the flavors in milk products, etc., is offered to graduate students as indicated below:

Milk Processing. Professors DAHLBERG, MARQUARDT, and HENING.

Ice Cream Manufacture. Professors DAHLBERG and HENING.

Cheese Making. Professors DAHLBERG and MARQUARDT.

Dairy and Protein Chemistry. Professor CARPENTER.

ENTOMOLOGY

Professors P. J. PARROTT, H. GLASGOW, F. Z. HARTZELL, S. W. HARMAN, P. J. CHAPMAN, D. M. DANIEL, G. E. R. HERVEY, F. G. MUNDINGER, and H. C. HUCKETT; and *Doctors* F. L. GAMBRELL, O. H. HAMMER, and L. A. CARRUTH.

The Staff of this Division is engaged in research work on a variety of agricultural insect pest problems of the State. Students may obtain, by arrangement, supervision of work on advanced research problems falling within the following fields: insect pests affecting deciduous fruits, vegetable crops, nursery and ornamental plants; biological control of insects, and applications of biometry and ecology in applied entomology.

Fruit Insects. Professors PARROTT, CHAPMAN, HARTZELL, HARMAN, MUNDINGER, and Dr. HAMMER.

Vegetable Insects. Professors GLASGOW, HUCKETT, HERVEY, and Dr. CARRUTH.

Insect Pests of Nursery and Ornamental Plants. Dr. GAMBRELL.

Applied Ecology. Professor HARTZELL.

Applications of Biometry. Professor HARTZELL.

Biological Control of Insects. Professor DANIEL.

PLANT PATHOLOGY

Professors O. A. REINKING, W. O. GLOYER, J. M. HAMILTON, H. S. CUNNINGHAM, R. O. MAGIE, D. H. PALMITER, R. F. SUIT, and G. L. MCNEW.

The Division offers opportunities for graduate research in diseases of fruits, vegetables, canning crops, and hops; fungicides; diseases caused by *Fusaria*; taxonomy of *Fusaria*; and ecology of plant diseases. Students may select problems as indicated below:

Diseases of Fruits. Professors HAMILTON, REINKING, GLOYER, PALMITER, and SUIT.

Diseases of Vegetables. Professors MCNEW, REINKING, GLOYER, and CUNNINGHAM.

Diseases of Canning Crops. Professors MCNEW and REINKING.

Diseases of Hops. Professor MAGIE.

Fungicides. Professors HAMILTON and MCNEW.

Diseases caused by Fusaria. Professor REINKING.

Taxonomy of Fusaria. Professor REINKING.

Ecology of Plant Diseases. Professors MCNEW and REINKING.

POMOLOGY

Professors R. WELLINGTON, H. B. TUKEY, R. C. COLLISON, B. R. NEBEL, and G. D. OBERLE.

This Division is engaged in research in the following fields: genetics of fruit breeding; plant propagation and rootstocks including stock and scion relations; developmental morphology of deciduous fruits; orchard-soil management; orchard management; cytology, applied and theoretical. No formal courses are offered, but students may register for work on problems as indicated below:

Fruit Breeding Problems. Professors WELLINGTON and OBERLE.

Developmental Morphology of Deciduous Fruits. Professor TUKEY.

Rootstock Problems, including Stock and Scion Relations. Professor TUKEY.

Fertilization and Nutritional Studies with Trees. Professor COLLISON.

Orchard Soil Technology. Professor COLLISON.

Cytology. Professor NEBEL.

SEED INVESTIGATIONS

Professors M. T. MUNN and W. F. CROSIER.

Seed investigations covering the wide field of seed production, distribution, and control are under way at the Station. By special arrangement qualified students can undertake graduate research in analytical methods, physiology of germination, taxonomy of incidental plant seeds, histology of seed structure, seed-borne microorganisms, seed control and improvement, and a few closely allied fields.

Seed Investigations. Professors MUNN and CROSIER.

VEGETABLE CROPS

Professors C. B. SAYRE and W. T. TAPLEY.

Students may obtain, by arrangement, supervision of work on problems in the history and description of varieties, plant nutrition, fertilizers, and fertilizer placement for vegetable crops, factors affecting quality of cannery vegetables, cropping systems, and improved methods of crop production and field plat technique. Studies in these fields of work can be best undertaken during the summer.

Effect of Fertilizers on Yield and Quality of Vegetables for Manufacture. Professor SAYRE.

Fertilization and Nutritional Studies with Vegetables. Professor SAYRE.

Variety Studies of Vegetables. Professor TAPLEY.

Vegetable Breeding Problems. Professor TAPLEY.

Vegetable Canning Crop Research Problems. Professor SAYRE.

FELLOWS: SCHOLARS: ROSTER OF DEGREES

FELLOWS AND GRADUATE SCHOLARS IN 1941-42

RESIDENT DOCTORS

Curt E. E. Berger, Ph.D., University of Berlin, 1932.
Sidney Herbert Cameron, Ph.D., University of California, 1927.
William Gilbert, A.B., Chicago University, 1936; Ph.D. Cornell, 1941.
Dwight Gunder, B.S., M.S., Iowa State, 1925, 1926; Ph.D., University of Wisconsin, 1933.
Esther Violet Hansen, A.B., Vassar, 1921; A.M. University of Wisconsin, 1922; Ph.D., Cornell, 1930.
Emily Gilchriest Hatch, A.B., Syracuse, 1919; A.M., Ph.D., Cornell, 1928, 1934.
Ralph Simon Palmer, A.B., University of Maine, 1937; Ph.D., Cornell, 1940.
Martha Potgieter, Ph.D., Columbia Teachers College, 1933.
Oved Shifriss, B.S., University of California, 1938; Ph.D., Cornell, 1941.
Margaret Hodgman Stone, Ph.D., Western Reserve University, 1940.
Everett Pepperell Wheeler, A.B., M.S., Ph.D., Cornell, 1923, 1926, 1930.

ENDOWED AND UNIVERSITY FELLOWS

The Anna Cora Smith Fellowship in Home Economics: Margaret Lillian Hockin, B.Sc., Mt. Allison University, 1932 (First term).
The Carl G. Schluederberg Fellowship in Chemistry and the John E. Teeple Fellowship in Chemistry: William John Argersinger, jr., A.B., Cornell, 1938.
The Clinton DeWitt Smith Fellowship in Agriculture: A. Kathrine Miller, A.B., Moravian College for Women, 1934; M.S., Columbia, 1936.
The Cornell Fellowship in English: Jean Valerie Elizabeth Whitehead, B.A., M.A., McGill University, 1939, 1941.
The Cornell-Brookings Fellowships in Economics (Cornell's share): Howard Spencer Dye, A.B., Cornell, 1941; Sami Semsiddin Tekiner, B.Law, Faculte of Law of Ankara, Turkey, 1936; A.M., Cornell, 1941.
The Edgar J. Meyer Memorial Fellowship in Engineering Research: Bal Dattatrey Kalelkar, B.E., Bombay University, 1940; M.S., Massachusetts Institute of Technology, 1941.
The Erastus Brooks Fellowship in Mathematics: Clifford Dixon Firestone, B.S., University of New Mexico, 1941.
The Fellowship in American History: Harold Seymour, A.B., Drew University, 1934; A.M., Cornell, 1940.
The Fellowship in Greek and Latin: Grace Bernice Ruckh, A.B., University of Buffalo, 1939; A.M., Cornell, 1940.
The Gage Fellowship in Animal Biology: Sarah Elizabeth Foresman, A.B., Wilson College, 1935; M.S. in Ed., University of Pennsylvania, 1936.
The George C. Boldt Fellowship in History: David Maldwyn Ellis, A.B., Hamilton College, 1938; A.M., Cornell, 1939.
The Henry Strong Denison Fellowships in Agriculture: Ernest Preston Edwards, B.A., University of Virginia, 1940; A.M., Cornell, 1941; Stephen Alexander Pieniazek, Ph.M., Warsaw University, 1938; M.S., Cornell, 1940; Raymond Francis Novak, B.S., North Dakota Agricultural College, 1941 (First term).
The McGraw Fellowship in Civil Engineering: Harry Eugene Rodman, B.S. in Arch Eng., Iowa State College, 1936; M. in Arch., Harvard University, 1937 (First term).
The duPont Fellowship in Chemistry: Arthur Morton Squires, A.B., University of Missouri, 1938.
The President White Fellowships in Physics: Norris George Nereson, B.A., Concordia College, 1939; M.A., University of Denver, 1941; Rosalind Bremmer Mendell, B.A., Hunter College, 1940.
The Sage Fellowship in Chemistry: Robert Stephen Weisz, A.B., Cornell, 1939.

The Schuyler Fellowship in Animal Biology: John George Mattysse, B.S., Iowa State College, 1940.

The Susan Linn Sage Fellowships in Philosophy: John Richard Benson Mates, B.A., University of Oregon, 1941; Douglas Neil Morgan, B.A., University of Michigan, 1940; Calvin Dwight Rollins, A.B., University of Nebraska, 1941; Kenneth Williams, B.A., Queen's University, 1940.

The Susan Linn Sage Graduate Fellowship in Psychology: Patricia Ann Cain, A.B., University of Nebraska, 1939.

The University Fellowship in Agriculture: Bernardo Guillermo Capó, B.S., University of Puerto Rico, 1929, M.S., Cornell, 1941.

The University Fellowship in Germanic Languages: Harry Breckenridge Partridge, A.B., Cornell, 1941.

The University Fellowship in Romance Languages: Klaus Israel Dreyer, A.B., Colby College, 1940; A.M., Cornell, 1941.

SPECIAL TEMPORARY FELLOWSHIPS

Allied Chemical and Dye Corporation Fellowship: Richard Berend Hasbrouck, B.S., University of Illinois, 1938.

American Potash Institute Fellowship: Donald Steven Keyfauver, B.S. in Agr., University of Arizona, 1940.

Beacon Milling Company Fellowship: Richard M. Forbes, B.S., M.S., Pennsylvania State College, 1938, 1939.

Dairy Products Industrial Research Fellowship: John A. Bierkan, B.S., University of Connecticut, 1941.

Ethyl Gasoline Corporation Fellowship: Robert E. McDonald, B.S., University of Illinois, 1939.

Frosted Foods Fellowship No. 13: Barbara Winifred Barnes, B.S., Syracuse, 1940; Ella G. Gleim, B.S., Cornell, 1938.

Frosted Foods Fellowship No. 14: James Charles Moyer, B.S.A., Ontario Agricultural College, 1936; M.S., University of Toronto, 1938.

G. L. F. Cereal-breeding Fellowship: Neal F. Jensen, B.S., North Dakota State College, 1939.

G. L. F. Dairy Cattle Fellowship: Hamilton D. Eaton, B.S., Iowa State College, 1939; M.S., Rutgers University, 1941; Charalambos S. Stephanides, B.S., Cornell, 1932; M.S., Cornell, 1941.

G. L. F. Poultry Fellowship: James McGinnis, B.S., North Carolina State College, 1940.

Juice Clarification Fellowship: Robert Louis Messier, B.S., Worcester Polytechnic Institute, 1940; M.S., Massachusetts State College, 1941.

Nassau County Farm Bureau Association Fellowship: Orson Silver Cannon, B.S., M.S., Utah State Agricultural College, 1935, 1937.

The New York Farmers Pasture Research Fellowship: Keith Kennedy, B.S., State College of Washington, 1940; M.S. in Agr., Cornell, 1941.

The New York Florists' Club Fellowship in Entomology: James L. Brann, B.S., Massachusetts State College, 1939.

The Nutrition Research Laboratories Fellowship: William L. Sippel, B.S., University of Maryland, 1938; V.M.D., University of Pennsylvania, 1940.

The Staten Island Growers' Fellowship: Aubrey Alfred Foster, B.S., Cornell, 1939.

The Western Condensing Company Fellowship: Herbert T. Peeler, B.S., Texas A. and M. College, 1940.

SCHOLARS

The Comstock Graduate Scholarships: Bernard Krafchick, B.S., College of the City of New York, 1936, M.S., Cornell, 1941; Agnes Irene Muller, B.S., in Ed. University of Missouri, 1931.

The Graduate Scholarship in Animal Biology: William Murray Longhurst, A.B., Stanford University, 1939; M.A., University of California, 1940.

The Graduate Scholarship in Architecture, Landscape Architecture, and Fine Arts: Leslie Stott O'Gwynn, jr., B.Arch., Alabama Polytechnic Institute, 1941.

The Graduate Scholarship in Botany, Geology, or Physical Geography: Reid Venable Moran, A.B., Stanford University, 1939.
The Graduate Scholarship in Greek and Latin: Mary Roberta Irwin, A.B., A.M., Indiana University, 1934, 1937.
The Graduate Scholarship in History: Thomas Watkins McElhiney, A.B., Johns Hopkins University, 1941 (First term).
The Graduate Scholarship in Veterinary Medicine: Alexander Donald Rankin, D.V.M., M.S., Cornell, 1939, 1940 (First term).
The Phi Kappa Phi Scholarship: James Brainerd Evans, B.S., Houghton College, 1941.

TUITION SCHOLARS

Samuel W. Atkins, B.S.A., M.S.A., University of Tennessee, 1921, 1927.
William L. Barr, B.S., M.S., Pennsylvania State College, 1936, 1940 (First term).
Mary Louise Benoit-Smullyan, A.B., Radcliffe, 1935.
M. Hildred Blewett, A.B., University of Toronto, 1935.
Robert McCrillis Carter, jr., A.B., University of Wisconsin, 1926; M.S., University of Vermont, 1939.
Shirley Cooper, A.B., Davis Elkins College, 1934; A.M., West Virginia University, 1940.
James E. Dewey, B.S., Cornell, 1940; M.S., University of Tennessee, 1941 (First term).
Julia Ann Flohr, B.S., Madison College, 1941.
Mary Boyce Hobson, B.A., Mills College, 1937.
Robert H. Hubbell, B.S. in Ed., Buffalo State Teachers College, 1940 (Second term).
Lloyd Clair Hulbert, B.S., Michigan State College, 1940.
Betty Jeanne Isaacs, B.S., Barnard College, 1941.
Thomas Wells Johnson, B.S., Massachusetts State College, 1941 (First term).
Cecil S. Lee, B.S., Madison College, 1940; M.S., Michigan State College, 1941.
Paul Bruce Marsh, A.B., M.S., University of Rochester, 1938, 1939.
Mary Louise Neville, B.A., University of Western Ontario, 1935; A.M., University of Illinois, 1938.
Wilbur Stanley Newcomer, B.S., Pennsylvania State College, 1941.
Charles Robert Nixon, A.B., Oberlin, 1939.
Mary Helen O'Connor, B.S., Carnegie Institute of Technology, 1941 (Second term).
Arthur A. Pava, B.S., Massachusetts State College, 1941 (Second term).
Richard H. Pian, B.S. in C.E., Hautes Etudes, Tientsin, China, 1941 (Second term).
Myron Arthur Rice, B.S., University of California, 1916; M.S. in Agr., Cornell, 1925.
Albert N. Robson, A.B , Swarthmore College, 1940 (First term).
Manuel Rodriguez-Diaz, A.B. in Ed., University of Puerto Rico, 1935.
Roger Roth, B.S., Syracuse University, 1940 (Second term).
Paul George Ruggiers, A.B., Washington and Jefferson College, 1940.
Betty Frances Scherer, A.B., Cornell, 1941 (Second term).
Henry M. Stevenson, A.B., Birmingham-Southern; M.S., University of Alabama, 1939.
Sien Moo Tsang, B.S., St. John's University, 1936; M.S., Cornell, 1940.
Minter Jackson Westfall, Jr., B.S., Rollins College, 1941.
Willard H. Whitcomb, B.S., Bates, 1938; M.S., Texas A. and M., 1942 (Second term).
John Lawrence Whitebread, A.B., Cornell, 1941.
Roger Wright Williams, B.S., M.S., University of Illinois, 1939, 1941 (First term).
Willie Garland Woltz, B.S., North Carolina State College, 1939.
Martin C. Yang, B.A., Cheeloo University, 1929.

LATIN-AMERICAN TUITION SCHOLARS

Jorge de Alba, B.S., University of Maryland, 1941.
Ruy Ribeiro Franco, Diploma Licenciate, Diploma Didactics, University of São Paulo, 1938, 1940.
Sergio Rivera-Acevedo, Ingeniero Civil, Chile University, 1939.
Pierre Georges Sylvain, Bachelier en Droit, Ecole Nationale de Droit du Port-au-Prince, 1932.
Carlos Vial, Ing. Agron., Catholic University of Chile, 1941.

ADVANCED DEGREES CONFERRED IN 1940-41

MASTERS OF ARTS

CONFERRED SEPTEMBER 25, 1940

Dora Boyce, A.B.; Mathematics, Education. Thesis: Certain Geometric Transformations Related to the Isogonal Transformation.
Edith May Crofoot, A.B.; History, Education. Thesis: King Alfred in History and Legend.
Elizabeth Louise Currie, B.A.; American Literature, Vocational Education. Thesis: A Study of the Influence of Women Upon Edgar Allan Poe.
Susan Eaker, A.B.; Dramatic Production, Dramatic Literature. Thesis: Steele and Percy MacKaye. Their Theories and Practice in the Theatre.
Faith Edgerton, A.B.; Literary Criticism, Education. Thesis: Shelley's Poetic Criticism.
Raymond Lewis Fisher, A.B.; Sixteenth Century Literature, Tudor and Stuart History. Thesis: *Ram Alley*, or *Merrie-Trickes* (1611), by Lording Barry, Edited with Introduction and Notes.
Julia Arabelle Fister, A.B.; English.
Albert Charles Ganley, B.A.; Social Studies.
Charles John Gaupp, jr., A.B.; Dramatic Production, Dramatic Literature. Thesis: John Dryden: His Theory and Practice of the Drama.
Barbara Miller Hammond, A.B.; Organic Chemistry, Analytical Chemistry. Thesis: An Attempted Synthesis of Normal Butylcholanthrene.
David Stewart Hawes, A.B.; Dramatic Production, Dramatic Literature. Thesis: Theodore Komisarjevsky's Theory of the Theatre.
John Blaker Herod, A.B.; Dramatic Production, Theatre Technique. Thesis: The Unit Set.
Francis Richard Hodge, A.B.; Dramatic Production, Dramatic Literature. Thesis: Theatrical Management in America in the Nineteenth Century.
Edwin Mars Irish, jr., A.B.; Physical Chemistry, Organic Chemistry. Thesis: A Study of Hindered Rotation in the Crystals of Homonuclear Diatomic Molecules.
Claire Stephanie Kopeck, B.S. in Ed.; Secondary Education, Social Studies Education. Thesis: An Analysis of the Status of Guidance in Schools of New York with 1,000 Pupils or More Outside New York City.
Elizabeth LePage, B.A.; Dramatic Production, Speech and Phonetics. Thesis: Methods of Production for Greek Plays.
Marion Charles Miller, A.B.; Eighteenth Century English Literature, English History. Thesis: The Vicar of Wakefield: A Study in English Morality.
William Dayton Powers, A.B.; Organic Chemistry, Inorganic Chemistry. Thesis: The Action of Fluorine on Aliphatic Acid Chlorides.
Dorothy Alden Sherman, A.B.; Dramatic Literature, Dramatic Production. Thesis: A Study of John Galsworthy's Plays.
Emily Rebecca Shott, A.B.; English History, American History. Thesis: William Laud, Administrator.
William Livingston Spalding, jr., A.B.; Modern European History, Medieval History. Thesis: Karl Renner's Theory of National Autonomy: The Austrian Socialist Interpretation of the Nationality Problem in the Hapsburg Monarchy.

Frances Ruth Thomson, B.A.; Dramatic Production, Speech Training, and Phonetics. Thesis: English Drama Between 1900–1918.
Elizabeth Eleanor Wilburn, B.A.; Dramatic Production, Dramatic Literature. Thesis: American Theatre Buildings in the Eighteenth Century.
Florence Evelyn Williamson, A.B.; Latin Literature, Latin Language. Thesis: A Rhetorical Study of the *De Lege Manilia*.

CONFERRED FEBRUARY 5, 1941

Mabel Carroll, A.B.; Sociology, Prices and Statistics. Thesis: Social-Economic Opinions of a Rural Population.
Richard Malone Davis, A.B.; Economic Theory and Its History, Money, Banking, and International Finance. Thesis: The Theories of Enterprise of Schumpeter, Knight, and Monroe.
Benedict Arthur Hall, A.B.; Plant Morphology, Cytology. Thesis: The Floral Anatomy of the Droseraceae, with Reference to the Commissural Stigma and the Theory of Carpel Polymorphism.
Josephine Bonar Howe, A.B.; The Romantic Period, American Literature. Thesis: Contemporary Opinion of Sir Walter Scott.
Arthur Earle Teele, A.B.; Modern European History, American History. Thesis: William Ewart Gladstone's Policy Towards Egypt.
Robert Adolph Wichert, A.B.; The Romantic Period, the Classical Period. Thesis: The Projected Works of Samuel Taylor Coleridge.

CONFERRED JUNE 16, 1941

John Michael Aden, A.B.; Eighteenth Century Literature, The Romantic Period. Thesis: Pope's Debt to Dryden in Poetry and Criticism.
June Babcock, A.B.; Latin Literature, Latin Language. Thesis: *Ars Sermocinandi ac Etiam Collationes Faciendi* of Thomas of Todi, MS. Paris, Bibl. Nat. 15965.
Bertha Maude Bartholomew, B.S.; Education.
Beatrice Shepherd Blane, B.A.; Modern European History, English History. Thesis: The Establishment of the July Monarchy and the Belgian Question.
Ruth Eleanor Bonner, A.B., A.M.; Rhetoric and Public Speaking, Speech and Phonetics. Thesis: A Course of Study in Speech for Secondary Schools.
Loren William Burch, A.B., B.D.; Rural Sociology, Literary Theory. Thesis: Some Factors Affecting Church-Attendance in Rural Oswego County.
Margaret Louise Crespo, A.B.; Vertebrate Zoology, Ornithology. Thesis: The Life Zone Concept and its Application to the West Indies.
Jack Herbert Crouch, A.B.; Dramatic Production, Dramatic Literature. Thesis: Dion Boucicault in the American Theatre.
Klaus Israel Dreyer, A.B.; French Literature, French Philology. Thesis: Marcel Proust's Treatment of the Professional Men.
Ernest Preston Edwards, B.A.; Ornithology, Vertebrate Zoology. Thesis: Frequency Range of Auditory Responses in Several Species of Captive Wild Birds.
Nancy Fuller Genet, B.A.; English Language and Literature, English History. Thesis: Theory of Comedy in *Le Misanthrope*.
Janet Maude Gilbert, A.B.; Social Studies.
Frances Fitz Gilliam, A.B.; English History, Elizabethan Literature. Thesis: Nationalism: as Expressed in the Parliaments of Elizabeth.
Norman Gustav Gunderson, A.B.; Algebra, Geometry. Thesis: Certain Modifications of Pascal's Triangle.
Howell Johnson Heaney, A.B.; English Language and Literature, Medieval Literature. Thesis: A Bibliography of Chaucer, 1934–1940.
Philip Heiberger, B.S. in Chem.; Physical Chemistry, Physics. Thesis: On Phase Changes in Monolayers Arising from Hindered Molecular Rotation.
Herman George Kohnken, B.S. (in Ed.); Social Studies.
Barbara George Kurtz, B.A.; Social Studies.
Henry Stuart Leff, A.B.; Dramatic Production, Dramatic Literature. Thesis: Maurice Schwartz and the Yiddish Art Theatre.

Arthur Franklin Martin, B.S.; Educational Administration, Educational Method. Thesis: A Study of Science Laboratory Equipment in New York State High Schools.

Maya Miller, B.A.; American Literature, English Drama. Essay: Walt Whitman and Carl Sandburg: A Study in Modern American Poetry.

Irma Solomon Putnam, A.B.; Dramatic Production, Dramatic Literature. Thesis: William Charles Macready Actor-Manager.

Albert Norvin Robson, jr., A.B.; American History, Modern European History. Thesis: River and Harbor Legislation 1882–1896: A Study of Congressional Log-rolling.

Alan Leo Schneider, B.A.; Dramatic Production, Dramatic Literature. Thesis: Nicolas Evreinov and "The Theatre in Life"; A Translation and an Introductory Study.

Rita Virginia Scott, A.B.; Speech and Phonetics, Dramatic Production. Thesis: The Speech of the Theatre.

Bernard Sherak, A.B.; Mathematics, Education. Thesis: Upper Bounds of the Number of Convergents Necessary to Approximate a Continued Fraction Within a Given Limit of Error.

Natalie Ruth Silverston, A.B.; American History, Modern European History. Thesis: Andrew Jackson and the Second United States Bank: An Essay in Historiography.

Richard Craine Snyder, A.B.; Biological Sciences.

Michael Supa, B.A.; Experimental Psychology, Systematic Psychology. Thesis: The Perception of Obstacles by the Blind.

Dean Hamilton Towner, A.B.; Latin Language and Literature, Greek Literature. Thesis: The Treatise of Alexander Numeniu *On the Figures of Thought and Diction* Rendered into English, with an Introduction and Notes.

William Oscar Trapp, A.B.; American Governmental Institutions, Public Administration. Thesis: Public In-Service Training in New York State.

Leon Henry Tykulsker, A.B.; Ethics, Political Theory. Thesis: The Political Theory of Harold J. Laski.

Robert Delaney Ward, B.S.; French, Spanish. Thesis: An Annotated Edition of *Le Reve* of Emile Zola.

Ruth Jane Welsch, A.B.; Foreign Languages.

Rex Merritt Wiest, B.S. in Ed.; The Romantic Period, The English Language. Thesis: A Dictionary of Proper Names in the Poetry of William Wordsworth.

MASTERS OF ARTS IN EDUCATION

CONFERRED SEPTEMBER 25, 1940

Orlo Roys Nichols, A.B.

Andrew Jackson Smith, A.B.

MASTERS OF SCIENCE

CONFERRED SEPTEMBER 25, 1940

Betty Burdette Bain, B.S.; Home Economics.

Robert Francis Ball, B.S.; Animal Breeding, Histology. Thesis: A Study of the Physiology of the "Naked" Fowl.

Edna Elizabeth Becker, A.B.; Ornithology, General Biology. Thesis: A Study of the Brown Thrasher *Toxostoma rufum* (Linnaeus).

Francis Jameson Bell, B.S.A.; Animal Nutrition, Animal Physiology. Thesis: The Digestion of Wheat Protein and Starch by the Dog.

Byron Reid Bookhout, B.S.; Farm Management, Marketing. Thesis: A Study of the Costs and Returns for the Common Feed Crops in New York State, 1937 and 1938.

Dick Nara Badhana Boon-Long, B.S. in Chem.; Organic Chemistry, Inorganic Chemistry. Thesis: Some Diphenol Derivatives.

Alice Mary Briant, B.Sc.; Foods, Nutrition. Thesis: Some Physical Properties of Potato Starch. A Study of Starch from Potatoes of Different Varieties and of Different Culinary Quality.

Evelyn Westover Byrd, B.S.; Home Economics.

Webster Allen Chandler, B.S.; Plant Pathology, Plant Physiology. Thesis: Studies on Elm Mosaic.

Clarissa Ina Cooledge, B.S.; Education, Biology. Thesis: Retention of Elementary Biology.

Rodney Brown Derickson, B.S. in Agr.; Marketing, Prices and Statistics, Business Management. Thesis: An Analysis of Variations in Prices Received for Potatoes, by Variety and Grade, Chicago, Illinois, 1932–1939.

Albert Wesley Fowble, E. E.; Physics, Education. Thesis: The Feasibility of the Electrostatic Energy Selector for Measuring Beta Rays of High Energy.

Bettina Mary Frost, A.B.; Bacteriology, Biochemistry. Thesis: A Study of the Actinomyces in the Mouths of Normal Cattle.

Kendrick Sherman Hart, B.S.; Agricultural Education, Farm Management. Thesis: Individual Programs Proposed for the Induction of Young Men into the Farm Business of Their Fathers.

William McKinley Houghton, B.S.; Farm Management, Agricultural Education: Thesis: The Growing of Peas and Beans for Market in the Central Part of New York State.

Laura Hall Jennings, A.B.; Bacteriology, Biochemistry. Thesis: Some Experiments on the Nutrition of Streptococci.

Gordon Harry Keown, B.V.Sc.; Veterinary Physiology, Animal Nutrition. Thesis: Some Effects of Intravenous Injections of Sodium Chloride Solutions in the Dog.

Herbert Richard Kling, B.S.; Farm Management, Prices and Statistics. Thesis: An Economic Study of Land Utilization in Wyoming County, New York.

Helena Perry Leahy, B.S.; Foods, Economics of the Household and Household Management. Thesis: A Study of Certain Institution Recipes to Determine the Proportions of Dry Milk Solids which may be Substituted Satisfactorily for Fluid Whole Milk as a Possible Means of Improving Nutritive Value and Decreasing Cost.

Joseph Daniel Loconti, A.B.; Organic Chemistry, Biochemistry. Thesis: A Study of Pectin.

Abraham Millenky, B.S.; Dairy Science, Marketing. Thesis: A Comparative Study of High-Temperature, Short-Time and Holder Pasteurization.

Clyde Dewey Mueller, B.S. in Agr.; Animal Breeding, Histology and Embryology. Thesis: Genetic Studies of Sex-Linked Albinism in the Fowl.

Vessie Howard Nicholson, B.S. in Agr.; Marketing, Prices and Statistics. Thesis: An Economic Study of the Sales of Vegetables in a New York City Chain Grocery System, July, 1938 to June, 1939.

Irma Jane Pintner, A.B.; Bacteriology, Histology. Thesis: The Occurrence of Streptococci on Plant Material.

Alexander Donald Rankin, D.V.M.; Animal Physiology, Animal Nutrition. Thesis: A Study of Absorption From the Rumen of Sheep.

Annette Richetta, B.S.; Foods, Nutrition. Thesis: A Study of Soft Meringues. The Effect of Some Physical and Chemical Properties of Egg Whites, of the Addition of Other Ingredients, and of Manipulative Procedure on the Quality of Soft Meringues.

William Ringgold Straughn, jr., B.S. in Ed.; Bacteriology, Histology. Thesis: Some Variants of the Escherichia-Aerobacter Genera.

Molly Geise Taber, B.S.; Physical Sciences.

Sien Moo Tsang, B.S.; Organic Chemistry, Industrial Chemistry. Thesis: A Study of Terphenyl Derivatives.

Lydia Marie Williams, B.S.; Home Economics.

James Edward Woodhull, B.S. in Agr.; Rural Education, Farm Management. Thesis: An Analysis of Educational Needs in a Vermont Community.

Myron Herbert Woods, B.S.; Zoology, Bacteriology. Thesis: Some Hirudinea of the Ithaca Region.

CONFERRED FEBRUARY 5, 1941

Franklin Sylvester Blanton, B.S.A.; Economic Entomology, Insect Ecology. Thesis: The Application of Thermal Treatments for the Control of Bulb Pests in the Northeastern United States.

Alfred Worden Boicourt, B.S.; Floriculture, Plant Physiology. Thesis: Studies of the Effect of Soil Aeration on the Growth of Hybrid Tea Roses.

Ruth Closson Boicourt, B.S.; Foods, Nutrition. Thesis: Factors Affecting the Iron Content of Potatoes.

Max Edwin Brunk, B.S.A.; Land Economics and Farm Finance, Farm Management. Thesis: Food, Fuel, and Rent Privileges in a Low-Income Rural Area in Southern New York, 1939–40.

Clarence Cummings, B.S.; Rural Education, Secondary Education. Thesis: The Relationship Between Certain Individual Factors and Scholastic Achievement.

Maria Carlota Florin, D.V.M.; Animal Pathology, Immunology. Thesis: Porcine Nephritis.

Harold Farquhar Furber, jr., S.B.; Organic Chemistry, Inorganic Chemistry. Thesis: A Study of the Vapor Phase Fluorination of Tetrachloroethylene.

Dorothy Marie Hatch, B.Ed.; Family Life, Educational Psychology. Thesis: A Study of the Adjusting of Four Pre-school Children to the Experimental Set-up for Nutritional Research.

Wendell Allen Hinkey, A.B.; Botany, Genetics. Thesis: Distribution of Aquatic Plants in New York: Monocotyledons.

Betty Jean May, B.S. in H.Ad.; Home Economics.

Richard Gordon Miller, B.A.; Biological Sciences.

Earl Barber Pattison, B.S.; Farm Management, Marketing. Thesis: Farm Mortgage Foreclosures in Wayne County, N. Y., 1925–1936.

Howard Spencer Potter, B.S.; Biological Sciences.

Simon Rottenberg, B.S.; Dairy Science, Agricultural Economics. Thesis: A Proposed High-Temperature, Short-Time Small Electric Milk Pasteurizer.

Paul Charles Rouzer, B.S. in Agr.; Educational Administration, Rural Social Organization. Thesis: A Physical Survey of Mineral County (West Virginia) Schools and Recommendations for Improvements in Organization and Buildings.

Paul Southworth Symonds, B.S.; Mechanics, Applied Physics. Thesis: The Measurement of Flow and Pressure in Fluids under Pulsating Conditions.

Mary Louise Thompson, B.Sc. in H.E.; Home Economics.

Lowell Dohner Uhler, B.S. in Ed.; Economic Entomology, Insect Ecology. Thesis: Morphological Studies and a Key to some Common White Grubs of New York.

William Goff Walter, B.S.; Bacteriology, Dairy Industry. Thesis: A Method of Determining the Microbial Contamination on Flat Surfaces.

Jackson Dan Webster, B.S.; Ornithology, Parasitology. Thesis: A Study of the Black Oyster-catcher, *Haematopus bachmani* Aud.

Kenneth Eugene Wheeler, B.S.; Floriculture, Plant Physiology. Thesis: Studies of the Effects of Certain Organic Materials and Fertilizers on the Growth and Flowering of Delphinium.

Dewitt Zien, B.S.; Economic Entomology, Science Education. Thesis: Feeding Experiments on the Mexican Bean Beetle, *Epilachna varivestis* Mulsant.

CONFERRED JUNE 16, 1941

George Woodford Abel, B.S.; Forest Ecology, Soils. Thesis: Factors Influencing the Natural Establishment of Forest Trees on Abandoned Land.

Elizabeth Guldin Althouse, B.S.; Botany, Plant Physiology. Thesis: The Anatomy of the Nodal Region in *Zea Mays* in Relation to the Orientation in Prostrate Stems.

Roice Hyrum Anderson, B.S.; Marketing, Farm Management. Thesis: The Delivery of Milk in Ithaca, New York, with Particular Reference to Efficiencies in the Use of Labor and Trucks, and Duplication in Delivery Service.

Bancherd Balankura, B.S.; Economic Entomology, Floriculture. Thesis: Recent Bibliography of the More Important Insect Pests of Thailand.

Crispina de Borja, B.S.H.E.; Home Economics.

Bernardo Guillermo Capó, B.S.; Statistical Methods of Analysis, Soils. Thesis: Methods of Interpreting the Results of Fertilizer Experiments.

Joseph Franklin Cassel, B.S.; Biological Sciences.

Mom Chao Chakrabandhu, B.S.A.; Genetics, Field Crop Production. Thesis: A Suggested Method for Crop Investigations in Thailand.

Thomas Cutter Chisnell, B.A.; Geomorphology, Structural Geology. Thesis: A Correlation Test of Knickpunkte.

Julius Cohn, B.S.; Plant Taxonomy, Vertebrate Zoology. Thesis: Keys. Based on Post-Floral Characters, to the Herbaceous Plants of the Cayuga Flora.

Priscilla Alden Copley, A.B.; Limnology, Insect Physiology. Thesis: Color as a Factor Influencing the Choice of Case Building Material by the Larvae of Trichoptera with Particular Reference to *Goera calcarata* Banks.

Ivanetta Hughes Davis, B.S.; Secondary Education, Supervision. Essay: Providing for Individual Differences Through the Activity Program.

René Pablo Delpech, Ingeniero Agronomo; Prices and Statistics, Marketing. Thesis: An Economic Study of the Cotton Production in Argentina.

Nancy May Eggleston, B.A.; Physiology, Biochemistry, Pharmacology. Thesis: Plasma Volume and Electrolyte Changes in Experimental Diabetes Insipidus.

Howard Ensign Evans, B.S.; Insect Taxonomy, Insect Ecology. Thesis: A Preliminary Review of the Nearctic Species of the Genus *Anoplius* with Notes on Related Genera (Hymenoptera, Psammocharidae).

Robert Franklin Fleming, B.S.; Organic Chemistry, Analytical Chemistry. Thesis: Studies of Some Acyl Phosphines.

Karl Frank, B.S.; Experimental Physics, Theoretical Physics. Thesis: Supersonic Absorption in Animal Tissues.

Eugene Jordan Gerberg, B.S.; Medical Entomology, Zoology. Thesis: The Mallophaga Occurring on the Falconiformes (Vultures, Kites, Hawks, and Eagles) of Eastern North America.

Dorothy Matilda Greey, B.S.; Home Economics.

Isidore Heller, B.S.; Biological Sciences.

Oliver Harold Hewitt, B.A.; Ornithology, Vertebrate Taxonomy. Thesis: A Study of the Ecology of the Artificial Fresh-Water Marsh with Special Reference to Ducks and Muskrats.

Margaret Lillian Hockin, B.Sc.; Home Economics.

Melvin Sidney Hofstad, D.V.M.; Diseases of Large Animals, Veterinary Obstetrics. Thesis: The Changes Produced by Brucella Abortus in the Milk and Udder of Cows Infected with Bang's Disease.

Dean Graeme Jones, B.S. in Agr.; Animal Breeding, Histology and Embryology. Thesis: Semen Production of White Leghorn Males from Strains Selected for High and Low Fecundity.

Robert Earle Jones, B.S.; Social Studies.

Bernard Krafchick, B.S.; Medical Entomology, Invertebrate Zoology. Thesis: The Structure of the Mouthparts of Blackflies with Special Reference to *Eusimulium lascivum* Twinn.

David Edward Madsen, D.V.M.; Veterinary Pathology, Bacteriology. Thesis: A Study of Some Pathogenic Fungi Isolated from Animals.

Russell Dickinson Martin, B.S.; Rural Education, Animal Husbandry. Thesis: Meeting Community Needs Through an Adult Education Program. A Study of the Rush-Henrietta Area.

William Glenn Mayes, B.S. (Chem.); Organic Chemistry, Physical Chemistry. Thesis: Derivatives of 1, 3-Cyclopentadiene.

Edna Pura Méndez, B.S.; Genetics, Parasitology. Thesis: Genetic Resistance to Diseases.

Clarence William Mulligan, B.S.; Agricultural Engineering, Rural Education. Thesis: A Study of the Needs for Training in Farm Mechanics in New York State.

Stuyvesant Morris Pell, B.S.; Vertebrate Zoology, Ornithology. Thesis: Notes on

the Habits of the Common Snapping Turtle, *Chelydra Serpentina* (Linn.) in Central New York.
Doris Welton Penix, B.S. in Ed.; Biological Sciences.
Piya Rangsit, D.V.M.; Animal Physiology, Veterinary Surgery. Thesis: Experiments on the Cardiovascular, Respiratory, and Secretory Mechanisms of the Sheep.
George Lloyd Richardson, B.S.; Bacteriology, Dairy Science. Thesis: The Oxygen Consumption of Bacteria and their Fate Without Oxygen.
Charalambos Stephanos Stephanides, B.S.; Social Studies. Essay: A Sociological Sketch of the Village of Megali Vrisi, Macedonia, Greece.
Robert Sutton, A.B.; Insect Toxicology, Economic Entomology. Thesis: The Toxicity of Some Compounds of Reinecke Salt to Newly Hatched Codling Moth Larvae.
Tit Wong, D.V.M.; Veterinary Bacteriology, Animal Pathology. Thesis: Virus Culture with Special Reference to that of Rabies.
Martin C. Yang, B.A.; Social Studies.

MASTERS OF SCIENCE IN EDUCATION

Conferred September 25, 1940

Clarence Henry Bensman, B.S. in E.E.
Arthur King Bradley, A.B.
Walter George Clifford, A.B.
George Gilpin Cook, B.S. Essay: The Determination of Content, Procedures and Techniques for Teaching Farm Machinery Repair in Vocational Agricultural Departments Based Upon the Experience of Farmers, Pupils, and Teachers.
Arthur Charles Eaton, B.S.
Kenneth Edward Gibbin, A.B.
Franklin Elias Giltner, B.S. Thesis: A Study of the Attendance Laws of the States of Pennsylvania, Ohio, Massachusetts, and Connecticut compared with the Attendance Laws of New York State.
Frederick Warren Hill, B.S.
Henry Colson Jackson, B.S.
Joseph Arthur Kemp, A.B.
Dorothy Lois Krieger, B.S. in Ed.
Robert Simpson Lyle, A.B.
Guy Leland Mathews, B.S.
N. Francis Miller, A.B.
Robert Elgin Parker, B.S.
Gladys Mildred Wafler, B.S.
Bernard Floyd Wilson, B.S.

Conferred February 5, 1941

William Dorland Webb, A.B.

Conferred June 16, 1941

Leonard Cornelius Buyse, A.B.
Frank Joseph Coyle, Jr., M.E., A.M.
Edward Alexander Doolan, B.S. Thesis: A Study of Non-Routine Uses of School Buses in New York State Central Rural Schools.
Gerald Burton Hoover, A.B.
Murray Dayton Lynds, B.S.
Albert William Meyn
Marie Clapp Moffit, B.S.
Robert Ellsworth Witter, B.S.

MASTERS OF SCIENCE IN AGRICULTURE

Conferred September 25, 1940

Paul James Fenton, B. S.; Agricultural Education, Secondary Education. Thesis: To Discover Factors Affecting Agricultural Opportunities.

Donald Daniel Harkness, B.S.; Agricultural Economics.
Champ McMillan Jones, B.S. in Agr.; Soils, Plant Breeding. Thesis: Effect of Fertilizers and Soils on the Percentage of Nitrogen in Crops.
Arthur Vincent Townsend, B.S.; Agricultural Education, Agricultural Engineering. Thesis: Opportunities for Boys Enrolled in Vocational Agriculture to Become Established in Farming on the Home Farm.

CONFERRED FEBRUARY 5, 1941

George Wesley Crowther, B.S.; Agricultural Engineering, Agricultural Economics. Thesis: A Study of Farm Holding and Quick Freezing Cabinets.

CONFERRED JUNE 16, 1941

Angel Matienzo Acosta, A.B., B.S. in Agr.; Plant Breeding, Cytology. Thesis: The Pineapple: History, Culture, and Improvement.
Henry Srinivasam Azariah, B.Sc. (Ag.); Farm Management, Rural Social Organization. Thesis: An Economic Study of the Cherry Enterprise in Wayne and Niagara Counties, New York.
Wilbert Keith Kennedy, B.S. in Agr.; Field Crop Production, Animal Nutrition. Thesis: The Grazing Habits of Cattle on the Composition, Consumption, and Utilization of Pasture Herbage.
Frank Vincent Kosikowsky, B.S.; Dairy Science, Bacteriology. Thesis: Factors Affecting Some of the Physical Properties of Cultured Skimmilk more Commonly Known as Cultured Buttermilk.
Juan Labadie, B.S. in Agr.; Farm Management, Marketing. Thesis: The Use of Farm Products in the Household, Northern Livingston County, New York, 1938.
Kirtley Bowen Lewis, B.S. in Agr.; Technical Agriculture.
Carlos Madrid, Ingeniero Agronomo; Soils, Plant Physiology. Thesis: Some Physical and Chemical Properties of the Soils of Tropical Regions.
John Winfield Magruder, B.S.; Field Crop Production, Agricultural Economics. Thesis: Hay Curing Studies in the United States.
José Marull, Ingeniero Agronomo; Technical Agriculture. Thesis: Notes on the Agriculture of Chile.
Fernando Mujica, Ing. Agr.; Plant Pathology, Genetics. Thesis: A Study on the Pathogenicity of Some Isolates of *Verticillium Albo-Atrum* Rei. and Berth.
Earl Hubert Regnier, B.S. in Agr.; Rural Social Organization, Educational Psychology. Thesis: Social Participation and Membership Characteristics of Farm Bureau Members and Non-Members of Cortland County, New York.
Arturo Riollano, B.S. in Agr., Plant Breeding, Vegetable Crops. Thesis: Breeding Cucumbers for Mosaic Resistance.
Mark Shou Ming Wu, B.A.; Rural Economy, Farm Management. Thesis: A Brief Study of the Federal Land Bank System in the United States.

MASTER OF LAWS

CONFERRED JUNE 16, 1941

Quintin Johnstone, A.B., J.D.; Procedure, Public Law, Labor and Industrial Relations.

MASTER OF ARCHITECTURE

CONFERRED JUNE 16, 1941

Robert Ingle Hoyt, B.F.A.; Regional and City Planning, Architectural Design. Thesis: A Physical Plan for Stamford, Connecticut.

MASTERS OF SCIENCE IN ENGINEERING

Conferred September 25, 1940

James Stephen Barko, B.S.; Hydraulic Engineering, Soil Mechanics. Thesis: Methods of Estimating Flood Flows With Particular Reference to the Unit Hydrograph Method.

Henry Alfred Byroade, B.S.; Structural Engineering, Soil Mechanics. Thesis: An Investigation of Multiple Split Ring Timber Joints in Tension.

Frederick James Clarke, B.S.; Soil Mechanics, Structural Engineering. Thesis: Flow of Water Through Coarse-Grained Soils.

Eric Dougan, B.S.; Transportation Engineering, Structural Engineering. Thesis: Belt Conveyors for Rolled Fill Earth Dams.

Thomas Allen Glass, B.S.; Transportation Engineering, Structural Engineering. Thesis: The Economics of Earth Dam Construction Equipment.

William Horace Lewis, B.S.; Soil Mechanics, Structural Engineering. Thesis: Flow of Water Through Granular Soils.

Howard Allen Morris, B.S.; Structural Engineering, Soil Mechanics. Thesis: An Investigation of Multiple Split Ring Timber Joints in Tension.

George Joseph Murray, jr., M.E., B.S.; Heat-Power Engineering, Hydraulic Engineering. Thesis: Convertible and Multi-Fuel Internal Combustion Engines.

Robert Stanley Palmer, B.S.; Structural Engineering, Hydraulic Engineering. Thesis: An Investigation of Multiple Split-Ring Timber Joints in Tension.

Charles Aloysius Pfeffer, B.S.; Soil Mechanics, Structural Engineering. Thesis: An Investigation of the Position of the Saturation Water Within an Earth Embankment During Drawdown.

Fred Earl Ressegieu, B.S.; Hydraulic Engineering, Soil Mechanics. Thesis: Methods of Estimating Flood Flows with Particular Reference to the Modified Rational Method.

Thomas Brownbridge Simpson, B.S. in Chem. Eng.; Soil Mechanics, Structural Engineering. Thesis: An Investigation of the Position of the Saturation Water Within an Earth Embankment During Drawdown.

Sidney George Spring, B.S.; Structural Engineering, Hydraulic Engineering. Thesis: Flow of Water Through Granular Soils.

William Bayer Strandberg, B.S.; Transportation Engineering, Structural Engineering. Thesis: Belt Conveyor For Rolled Earth Fill Dams.

Daniel Lee Whitehead, B.S. in E.E.; Electric Power Generation, Transmission, and Distribution, Physics. Thesis: The Electrical Characteristics of Steel-Cored Aluminum Cables.

Conferred June 16, 1941

George Hamilton Baker, B.S.; Electrical Communications, Physics. Thesis: A Photo-Electric Microphone.

Louis Schoudel Bock, M.E.; Industrial Accounting, Industrial Marketing. Thesis: Some Elements of Management Control.

Islâm Erokan; Photogrammetry, Geodetic Astronomy. Thesis: Theory of Rectification and Rectifiers.

Abdülkerim Evinay; Photogrammetry, Geodetic Astronomy. Thesis: Radial Triangulation.

Chester Edgar Hockert, B.S. in M.E.; Machine Design, Heat-Power Engineering. Thesis: Acceleration Determinations and Procedure, Using Graphical Methods, for Force Analysis of an Articulated Connecting Rod Engine.

Maximo Pastrana Lachica, B.S.C.E.; Geodesy, Astronomy. Thesis: Topographic Mapping of the Philippines.

Selahattin Sevgör; Photogrammetry, Geodetic Astronomy. Thesis: The Multiplex Aero-Projector.

Ziyaettin Soydan; Photogrammetry, Geodetic Astronomy. Thesis: Geodetic and Photogrammetric Error Theory.

MASTER OF CHEMICAL ENGINEERING

CONFERRED SEPTEMBER 25, 1940

Sidney Philip Lee, B.S.; Chemical Engineering, Physical Chemistry. Thesis: Vapor Liquid Equilibria for the System: Benzene-Monochlorobenzene-Para-Dichlorobenzene.

MASTERS OF CIVIL ENGINEERING

CONFERRED SEPTEMBER 25, 1940

Joseph Garcia, B.C.E.; Structural Engineering, Hydraulic Engineering. Thesis: Photoelastic Analysis of Stress Distribution around Welded Joints.

George Edwin Hatch, B.S. in C.E.; Hydraulic Engineering, Soil Mechanics. Thesis: Embankment Design for an Earth Dam on Six Mile Creek, Ithaca, New York.

Conrad Paul Straub, B.S. in C.E.; Sanitary Engineering, Bacteriology. Thesis: A Study of the Pollution of the Stewart Park Bathing Area.

CONFERRED JUNE 16, 1941

Charles Bartol Plog, B.S. (C.E.); Materials of Engineering, Mechanics. Thesis: The Strengths and Durabilities of Concretes Made with Treated Cements.

Robert Kenneth Schrader, B.S. in C.E.; Structural Engineering, Mechanics. Thesis: An Investigation of the Lateral Stability of Unsymmetrical I-Beams.

MASTERS OF MECHANICAL ENGINEERING

CONFERRED SEPTEMBER 25, 1940

Nicholas Kulik, M.E.; Heat-Power Engineering, Structural Engineering. Thesis: The Specific Heats of Gases at Temperatures and Pressures Occurring in Engineering Applications.

Rocco Victor Vittucci, M.E.; Experimental Engineering, Mathematics. Thesis: Effects of Varying the Spacing of Sections in Cast Iron Radiators.

DOCTORS OF PHILOSOPHY

CONFERRED SEPTEMBER 25, 1940

Carrolle Elizabeth Anderson, B.S., M.S.; Morphology, Cytology, Vertebrate Zoology. Thesis: Some Studies on the Floral Anatomy of the Liliales.

James Johnston Anderson, A.B., M.B.A.; American Governmental Institutions, International Law and Relations, Political Theory. Thesis: The President's Supreme Court Proposal—A Study in Presidential Leadership and Public Opinion.

Harlan Parker Banks, A.B.; Paleobotany, Paleontology, Bacteriology. Thesis: Devonian Plants from Southeastern New York.

Millard Vernon Barton, B.S. Eng., M.S.; Mechanics, Mathematics, Machine Design. Thesis: The Elastic Cylinder with a Ring of Uniform Pressure on a Finite Length of the Surface.

Cyrus Ezra Beekey, B.S., M.S.; Insect Ecology, Morphology, Zoology. Thesis: The Relation of Environmental Factors to Periodic Fluctuation of the Invertebrate Fauna of Forest Soil.

Ralph Bogart, B.S. in Agr., M.S.; Animal Breeding, Animal Nutrition, Histology and Embryology. Thesis: The Influence of Reproductive State Upon Growth and the Ability to Reproduce and Lactate in the Female Rat.

Ross Eldon Bowers, A.B., A.M.; Animal Nutrition, Organic Chemistry, Entomology. Thesis: The Vitamin and Lipid Requirements of the Cockroach, *Blattela Germanica, L.*

James Stanley Brooks, A.B.; Cytology, Plant Taxonomy, Genetics. Thesis: The Cytology and Morphology of the Lemnaceae.

Elmer Evans Brown, A.B.; Herpetology, Vertebrate Zoology, Biology. Thesis: Life History and Habits of the Northern Water Snake, *Natrix sipedon sipedon* Linne.

Mark Twain Buchanan, B.S. in Agr.; Prices and Statistics, Marketing, Money, Banking, and International Finance. Thesis: Price Flexibility and International Price Movements.

Gordon Mann Cairns, B.S., M.S.; Animal Husbandry, Animal Nutrition, Veterinary Physiology. Thesis: The Use of Lamb Fattening Experiments in Determining the Relative Net Energy Values of Distillers' Corn Dried Grains and Brewers' Dried Grains in Comparison with Corn Grain.

Robert Lyle Carolus, B.S., M.S.; Vegetable Crops, Plant Physiology, Agronomy. Thesis: The Yield and Composition of the Tomato as Influenced by Calcium and Potassium.

John Niessink Cooper, A.B.; Experimental Physics, Theoretical Physics, Mathematics. Thesis: The Auger Effect in Relative Intensities and Widths of X-Ray Lines.

Paul Arthur Cundiff, A.B., A.M.; Victorian Literature, American Literature, Elizabethan Literature. Thesis: A New Interpretation of Book I of "The Ring and the Book."

Otis Freeman Curtis, jr., A.B.; Plant Physiology, Botany, Biochemistry. Thesis: A Study of Certain Factors Influencing the Formation of Carotene in Leaves.

Earle Ernst, A.B., A.M.; Drama and the Theatre, Dramatic Literature, History of Music. Thesis: Cycles in the Development of the Dramatic Arts.

Jasper Newton Ferguson, jr., B.S ; Physics, Theoretical Physics, Mathematics. Thesis: The Photoconductivity of Sodium Chloride in the Far Ultraviolet.

Marvin Walter Formo, B. Chem.; Organic Chemistry, Physical Chemistry, Biochemistry. Thesis: The Relative Reactivities of Organic Radicals.

Ernest Aiken Grant, B.S., M.S.; Agricultural Education, Rural Sociology, Secondary Education. Thesis: A Proposed Program for the Improvement of Pre-employment Teacher Training in Agriculture for Negroes in Alabama Based Upon an Analysis and Evaluation of What Teachers of Agriculture Do.

Lester Eugene Hanson, B.S., M.S. in Agr.; Animal Husbandry, Animal Nutrition, Genetics. Thesis: Vitamin A and D and Protein Supplements for Growing and Fattening Fall Pigs in Dry Lot.

John Edward Hatcher, B.S.; Chemical Engineering, Organic Chemistry, Physical Chemistry. Thesis: Heat Transfer and Pressure Drop in Staggered Tube Banks.

Robert Arthur Hume, A.B., LL.B., A.M.; American Literature, Seventeenth Century Literature, Eighteenth Century Literature. Thesis: *The Education of Henry Adams:* A Critical Estimate.

Homer Alexander Jack, B.S., M.S.; Science Education. Vertebrate Zoology, Sociology, Thesis: The Biological Field Stations of the World, A Comparative and Descriptive Study.

Alexander Joss, B.S. in Agr. Bus., M.S. in Agr.; Farm Management, Business Management, Public Finance. Thesis: An Economic Study of Land Utilization in Otsego County, New York, 1938.

Baburao Shankarrao Kadam, B.Sc., M.S.; Cytology, Genetics, Plant Pathology. Thesis: Chromosome Studies in Relation to Fertility and Vigor in Inbred and Open-pollinated Strains of Autotetraploid Maize.

Anna Margaret Dale Kek, B.A., M.A.; Latin Language and Literature, Latin Language, The Comparative Study of Literature. Thesis: *Oportere, debere, convenire, decere, necesse esse, opus esse,* and *usus esse* in Republican Latin.

William Raymond Kendall, A.B., A.M.; Musicology, History of Painting, Philosophy. Thesis: Samuel Mareschall, His Life and Works (1554–1640).

James Ellsworth Kraus, B.S., M.S.; Vegetable Crops, Plant Breeding, Plant Physiology. Thesis: The Effects of Partial Defoliation at Transplanting Time on Subsequent Growth and Yield of Certain Vegetable Crop Plants.

James Howard Lambert, B.S., A.M.; Vocational Education, Educational Psychology, Secondary Education. Thesis: An Analysis of Some Factors Which are Significant in the Training and Experience of Teachers of Shop Subjects in Vocational Industrial Education.

Frederick Harold Leinbach, B.S., M.S.; Animal Husbandry, Animal Nutrition, Veterinary Physiology. Thesis: The Relative Net Energy Values of Alfalfa Hay and Corn Grain and of Sorghum Fodder and Alfalfa Hay as Determined by Feeding Experiments with Fattening Lambs.

John Colby Lewis, A.B., M.F.A.; Dramatic Production, Dramatic Literature, History of Painting. Thesis: A Correlation of the Theatre with the Graphic Arts, According to the Dominant Artistic Theories of Several Times, from the Middle Ages to the Present Day.

Ching-Chun Li, B.S.; Plant Breeding, Cytology, Plant Pathology. Thesis: The Competition Effect, Size, and Shape of Plat and the Use of Check Plats in Cotton Experiments.

Charles Buell Lipa, A.B., A.M.; English Poetry, 1500–1750, American Literature, Victorian Literature. Thesis: The Critical Theory of William Blake.

Edwin Henderson Lombard, A.B., A.M.; Dramatic Literature, Dramatic Production, Rhetoric and Public Speaking. Thesis: Plot, Character, and Action: A Study of Dramatic Theory and Practice.

J. Edwin Losey, B.S., M.S.; Rural Social Organization, Cooperative Marketing, Educational Psychology. Thesis: Membership Relations of a Cooperative Purchasing Association.

Robert Henry McCauley, jr., A.B.; Vertebrate Zoology, Entomology, Botany. Thesis: A Distributional Study of the Reptiles of Maryland and the District of Columbia.

George Manner, A.B.; International Law, Constitutional Law, Philosophy. Thesis: The Position of the Individual in International Law.

Lester Barnett Mason, A.B., A.M.; Modern European History, American History, International Law and Relations. Thesis: The Concept of the French Constitution of the Old Regime from Louis XIV to the French Revolution.

Kelso Bronson Morris, B.S., M.S., Inorganic Chemistry, Analytical Chemistry, Physical Chemistry. Thesis: The Action of the Complex Delectronator, Potassium Permanganate, Upon Hydroxylamine in Sulfuric Acid Solution.

Milo James Peterson, B.S., M.S. in Agr.; Agricultural Education, Secondary Education, Farm Management. Thesis: Factors Influencing the Success or Failure of a Selected Number of Supervised Farming Programs.

Paul Lewis Poirot, B.S.; Farm Management, Prices and Statistics, Money, Banking, and International Finance. Thesis: A Study of Rented Farms in New York with Emphasis on Rental Agreements.

Delbert Joseph Pugh, A.B., A.M.; Social Studies Education, American History, Constitutional Law. Thesis: The Validation of a Technique for Measuring Certain Aspects of Civic Attitude of Ninth Grade Pupils.

Frank Joseph Rudert, A.B.; Bacteriology, Organic Chemistry, Physical Chemistry. Thesis: A Study of *Lactobacillus Casei* and Related Organisms.

Arnold Edward Schumacher, B.S., M.S.; Animal Nutrition, Biochemistry, Animal Physiology. Thesis: Factor R and Factor S, Components of an Alcohol-Precipitate of a Water Extract of Yeast, Required by the Domestic Fowl.

Tsuin Shen, B.S.; Pomology, Plant Physiology, Plant Anatomy. Thesis: The Influence of Leaf-fruit ratio on Alternate Bearing in the Apple.

Winfield Scott Stone, D.V.M., M.S.; Diseases of Breeding Animals, Physiology of Reproduction, Immunology. Thesis: Brucellosis in Horses and Goats in New York State.

Susanne Thompson, B.S., A.M.; Rural Social Organization, Family Life, Educational Psychology. Thesis: A Comparative Study of Women Students in Home Economics, Arts and Sciences, and Education with Respect to Certain Social and Personality Characteristics.

Cornelius Marsden Vanderwaart, B.S.; Chemical Engineering, Organic Chemistry, Physical Chemistry. Thesis: The Mechanism of Heat Transfer in Staggered Tube Banks.

Matt Frank Vessel, B.E.; Science Education, Botany, Limnology. Thesis: A Study of Conservation Education in the Rural Areas of the United States.

Robert Corbin Vincent, A.B., A.M.; Inorganic Chemistry, Organic Chemistry,

Analytical Chemistry. Thesis: Sulfur Dioxide as a Volatile Component in Binary Systems.

George Rea Walker, B.S., M.S.; Plant Breeding, Morphology, Cytology. Thesis: A Genetical Study of Seed Weight, Lint Index and Lint Percentage in the American Upland Group of Cottons.

Horace Glenn White, A.B., A.M.; Money, Banking, and International Finance, Public Finance, Organization and Control of Industry. Thesis: Foreign Transactions in American Stock Exchange Securities.

Alexander James Wood, B.S.A., M.S. in Agr.; Bacteriology, Biochemistry, Soils. Thesis: A Preliminary Study of the Dehydrogenases of *Streptococcus Mastitidis*.

Karl Theodore Wright, B.S., M.S.; Farm Management, Prices and Statistics, Public Administration and Finance. Thesis: Farm Success Factors in Central Michigan.

CONFERRED FEBRUARY 5, 1941

Charles Parker Baker, A.B., A.M.; Experimental Physics, Theoretical Physics, Mathematics. Thesis: Measurements with a Neutron Velocity Spectrometer.

Walter Balderston, A.B.; Mediaeval History, Political Theory, English History. Thesis: Law-Making in Mediaeval England from the Seventh to the Fourteenth Century.

Henry Thomas Batt, B.V.Sc., M.V.Sc., M.S.; Animal Physiology, Biochemistry, Animal Breeding. Thesis: Carbohydrate Metabolism Studies in the Domestic Fowl II. The Response of the Blood Sugar Level to the Ingestion of Glucose III. The Ascending Glucose Renal Threshold.

Willard Chrisler Beatty, A.B.; Money, Banking, and International Finance, Organization and Control of Industry, Economic Theory and Its History. Thesis: Security Loans, 1924–1930.

Jack Mayson Bickerton, B.S.A.; Plant Pathology, Plant Physiology, Floriculture. Thesis: A Study of Two Important Diseases of Carnations: Alternaria Blight Caused by *Alternaria Dianthi* Stev. and Hall and Fusarium Yellows Caused by *Fusarium Dianthi* Prill. and Del.: and their Control on Long Island.

William George Bodenstein, B.S., M.S.; Economic Entomology, Insect Taxonomy, Insect Ecology. Thesis: Methyl Bromide Fumigation for Greenhouse Pest Control.

F. Gray Butcher, A.B., A.M.; Economic Entomology, Plant Pathology, Parasitology. Thesis: A Study of the Millipede, *Diploiulus londinensis caeruleocinctus* (Wood), with Special Reference to its Injury to Potato Tubers.

Jonathan Wadhams Curvin, A.B., A.M.; Dramatic Production, Speech and Phonetics, Dramatic Literature. Thesis: The Realistic Tradition in American Art and Drama.

Sarah Creecie Dyal, A.B., A.M.; Plant Taxonomy, Plant Morphology, Cytology. Thesis: Studies in the Family Valerianaceae.

Chiang Huang, B.S.C.E., M.C.E.; Structural Engineering, Railway Engineering, Soil Mechanics. Thesis: The Application of Fourier's Series to the Suspension Bridge with a Continuous Stiffening Truss.

Kung Hsiang Lin, B.S.; Plant Pathology, Plant Anatomy, Plant Physiology. Thesis: A Physiological Study of Certain Apple Rots.

Oscar Anthony Lorenz, B.S.; Vegetable Crops, Plant Breeding, Plant Physiology. Thesis: A Study of Internal Breakdown of Garden Beets with Special Reference to Boron-Cation Relationships.

Jennie Amabel McIntosh, B.S., M.S.; Biochemistry, Physiology, Foods and Nutrition. Thesis: The Effect of Different Cooking Methods on the Vitamin C Content of Quick Frozen Vegetables.

Thomas Nelson Magill, A.B., A.M.; Dramatic Literature, Dramatic Production, Victorian Literature. Thesis: Character in the Drama.

Harrison Eisenbrey Newlin, A.B.; Animal Nutrition, Biochemistry, Organic Chemistry. Thesis: The Bone Marrow as a Site of Fat Deposition.

Anson John Pollard, B.S., M.S.; Marketing, Prices and Statistics, Economics. Thesis: A Statistical Analysis of Seasonal Variation of Production in the New York Milk Shed, with Special Reference to the Effects of Selected Production Adjustment Plans Upon Price Returns to Producers.

James Neville Roney, B.S., M.S.; Economic Entomology, Ecology, Vegetable Crops. Thesis: The Potato Leafhopper *Empoasca Fabae* Harris and its Injury to Muckland Potatoes.

Paul Albert Smith, B.S.; Bacteriology, Physical Chemistry, Organic Chemistry. Thesis: The Lactic Acid Fermentation of the Streptococci.

Robert Dean Sweet, B.S. in Ed., M.S.; Vegetable Crops, Plant Breeding, Plant Physiology. Thesis: Cultivation Studies of Certain Vegetables Grown on Peat Soils.

Chen-Hsu T'ang, B.S.C.E., M.C.E.; Experimental Hydraulics, Hydraulic Engineering, Railroad Engineering. Thesis: Turbulent Resistance in Non-Pressure Conduits.

John Bruce Todd, B.S., A.M.; Inorganic Chemistry, Organic Chemistry, Economic Geology. Thesis: Studies in the Chemistry of Azido-Carbondisulfide and the Azido-Dithiocarbonates.

Claudius Van der Merwe, B. Comm., M. Comm.; Prices and Statistics, Marketing, Money, Banking, and International Finance. Thesis: The Effects of Currency Depreciation on Prices, Production, and Foreign Trade.

Ibrahim Yasa, A.B., A.M.; Rural Social Organization, Rural Education, Anthropology. Thesis: A Comparative Study of Selected Attitudes of Rural and Town High School Seniors.

Conferred June 16, 1941

Richard Thomas Allman, B.S.A.; Field Crop Production, Animal Nutrition, Plant Breeding. Thesis: The Effects of the Lignin and Protein Content on the Nutritional Value of Pasture Herbage.

Elias Milton Andersen, B.S.; Vegetable Crops, Plant Physiology, Plant Breeding. Thesis: The Effects of Certain Environmental and Plant Factors on Tipburn of Iceburg Lettuce.

Richard Bernard, B.Sc.Ap., M.A., M.Sc.; Animal Nutrition, Physiology, Zoology. Thesis: The Digestion of Cereals by Minks (*Mustela Vison*) and Foxes (*Vulpes Fulva*) with Special References to Starch and Crude Fiber.

Jack Bernstein, A.B.; Organic Chemistry, Physical Chemistry, Biochemistry. Thesis: The Preparation and Relative Reactivities of Some Substituted Benzyl Fluorides.

George Willard Berry, A.B., M.S.; Structural Geology, Petrology, Geomorphology. Thesis: Stratigraphy and Structure at Three Forks, Montana.

George Robert Bishop, B.S., A.M.; Marketing, Agricultural Prices and Statistics, Economics. Thesis: An Economic Study of the Buffalo Milk Market.

George Thomas Blanch, B.S., M.S.; Farm Management, Marketing, Prices and Statistics. Thesis: An Economic Analysis of Dairy Cash Crop Farms in the Market Area of Ogden, Utah, 1937 to 1939.

Mary Fuertes Boynton, A.B., A.M.; The English Language and Literature, Rhetoric, English History. Thesis: Dante and Sacred Rhetoric.

LeRoy Clinton Breunig, jr., A.B., A.M.; General History of French Literature, French Philology, Spanish. Thesis: The Treatment of the Crowd in French Naturalism.

Helen Wheatland Burrell, B.A.; Modern French Literature, French Literature of the 17th Century, French Language. Thesis: Hector-Henri Malot and the Social Novel (1830–1907).

John Gilbert Cady, B.S., M.S.; Forest Soils, Mineralogy, Analytical Chemistry. Thesis: Some Relationships Between Forest Type and Certain Chemical and Mineralogical Properties of Podzol and Brown Podzolic Forest Soil Profiles.

Joseph Edgar Chevrette, B.A., B.S.A.; Plant Breeding, Plant Physiology, Agronomy. Thesis: Inheritance of Earliness and Other Characters in Spring Wheat.

Fred Clarenbach, A.B., A.M., B.S. in Ed.; Public Finance, Organization and Control of Industry, Economic Theory and Its History. Thesis: The Problem of Reorganizing the Finances of Local Government in Ozark Land Use Adjustment Areas.

Richard Collier Crosby, B.S., M.S. in Ed.; Educational Psychology, Sociology, Educational and Mental Measurements with Statistics. Thesis: The Measurement of Interest and Its Utility in College Personnel Work.

Santiago Ramirez Cruz, B.S.M.E., B.S.E.E., M.S. in Agr.; Agricultural Engineering, Poultry Husbandry, Statistical Methods of Analysis. Thesis: Vol. I: Artificial Incubation. Vol. II. Electrolytic Heater for Incubator:

Walter Strother Davis, B.S., M.S. in Agr.; Agricultural Education, Animal Husbandry, Animal Breeding. Thesis: The Establishment of Negro Young Men in Farming: A Study of Opportunities and Qualifications of Negro Young Men for Becoming Established in Farming in West Tennessee.

Herrell Franklin DeGraff, B.S.; Farm Management, Marketing, Business Management. Thesis: An Economic Study of Farming in the Town of Newfane, Niagara County, New York.

Frank Leslie Dorn, B.S., M.S.; Bacteriology, Dairy Chemistry, Agronomy. Thesis: The Production of Gases in the Ripening of Cheese.

Josephine Dudley, A.B., A.M.; Histology and Embryology, Vertebrate Zoology, Invertebrate Zoology. Thesis: The Development and Fate of the Ultimobranchial Body of the Common Fowl, *Gallus Domesticus*.

Clark Allan Dunn, B.S., M.S., C.E.; Structural Engineering, Soil Mechanics, Mechanics. Thesis: A Study of Columns Having Elastic Lateral Supports.

Harvey Paul Eder, B.S.; Organic Chemistry, Inorganic Chemistry, Analytical Chemistry. Thesis: Substituted Aliphatic Hydrazines.

Scott Bowen Elledge, A.B., A.M.; Seventeenth Century Literature, Literary Criticism, Elizabethan Literature. Thesis: Milton's Imagery.

Alma Randall Emmons, A.B., A.M.; The Romantic Period, American Literature, Prose Fiction. Thesis: The Highlander in Scottish Prose Fiction.

Frederick Seward Erdman, B.S., B.S. in M.E., M.M.E.; Hydraulic Engineering, Experimental Mechanical Engineering, Mechanics. Thesis: Some Developments in Methods of Analysis and Design of Propeller Pumps.

Donald Bryce Ferguson, B.S., M.S. in Agr.; Marketing, Farm Management, Business Management. Thesis: The Movement and Financing of Replacements for New York Dairy Herds, 1938–39.

Charles Edward Galbreath, A.B., A.M.; Money and Banking, Organization and Control of Industry, Economic Theory. Thesis: Sterling Area: Its Development and Operation.

Paul Geoffrey Gelrud, B.S., A.M.; Musicology, Musical Composition, Modern European History. Thesis: A Critical Study of the French Violin School, 1782–1882.

Harold Clayton Grinnell, B.S., M.S.; Public Administration and Finance, Farm Management, Economics. Thesis: Local Government and Taxation in Rural New Hampshire.

Irving James Gruntfest, Sc.B. in Chem., Sc.M.; Physical Chemistry, Organic Chemistry, Physics. Thesis: The Electrostatic Influence of Substituents on the Ionization Constants and Reaction Rates of Some Organic Compounds.

Everett Morrison Hankins, B.A., M.A.; Literary Criticism, Sixteenth Century Literature, English History. Thesis: Literary Criticism by William Wordsworth.

Walter Joel Harrington, A.B., A.M.; Algebra, Mathematical Analysis, Physics. Thesis: A Study of Certain Functions Auxiliary to Brun's Method in Number Theory.

Carl McClellan Hill, B.S., M.S.; Organic Chemistry, Inorganic Chemistry, Analytical Chemistry. Thesis: Studies of Ketenes and their Derivatives.

Lemuel Lee Hill, A.B., A.M.; Economic Entomology, Plant Pathology, Insect Embryology. Thesis: A Study of the Tarnished Plant Bug *Lygus pratensis* L. and its Injury to Celery with Special Emphasis on Control Measures.

Charles Seright Hobbs, B.S., M.S. in Agr.; Animal Husbandry, Animal Nutrition, Veterinary Physiology. Thesis: The Relative Value of Linseed Meal, Corn Gluten Meal, Soybean Oil Meal, and Ground Soybeans as Protein Supplements for Fattening Yearling Steers.

Earl Lawrence House, B.S., A.M.; Histology and Embryology, Anatomy and Neurology, Physiology. Thesis: The Development of the Hypophysis of the Ox.

Vernon C. Jamison, B.S.; Soils, Physical Chemistry, Plant Physiology. Thesis: A Study of the Structure of the Dunkirk Silty Clay Loam and Some Organic Soils by Means of pF Moisture Relations.

Stewart McNeil Johnson, B.S., M.S.; Marketing, Prices and Statistics, Economic Theory. Thesis: Factors Affecting the Supply of Milk in Vermont.

Leslie Gordon Joyner, Sc.B. in Chem.; Physical Chemistry, Organic Chemistry, Mathematics. Thesis: Dielectric Polarization of Solutions of Glycine in Dioxane-Water Mixtures in Relation to Dipolar Ion Formation and Dipole-Dipole Interaction.

Theodore William Kerr, jr., B.S.; Economic Entomology, Field Crop Production, Pomology. Thesis: The White Grub (*Phyllophaga* Spp.) in Western New York and its Control in Strawberries.

Clarence Edward Klapper, A.B. Histology and Embryology, Anatomy, Physiology. Thesis: A Study of the Development of the Pharyngeal Derivatives in the Guinea Pigs (*Cavia cobaya*).

Leslie Tse-Chiu Kuo, B.Comm., A.M.; Public Administration and Finance, Prices and Statistics, Regional and City Planning. Thesis: Changes in Population and Their Significance for Local Government in New York.

John Irving Lacey, A.B.; Psychology, Physiological Psychology, Neuroanatomy. Thesis: An Experimental and Theoretical Analysis of Frustration: Physiological and Psychological Consequences.

James Joseph Lander, B.S., M.S.; Physical Chemistry, Mathematics, Physics. Thesis: The Electrostatic Influence of Substituents on Reaction Rates.

William Mason Lawrence, B.S.; Limnology and Fisheries, Vertebrate Zoology, Parasitology. Thesis: The Effect of Feeding Madder Root to Rainbow Trout and its Practical Application for Marking Fish.

Gwoh-Liang Lee, B.C.E., M.S.; Structural Engineering, Mechanics, Heat-Power Engineering. Thesis: An Analytical Method of Determining Stresses in a Soil Layer.

Yen Liang Lee, B.C.E., M.S.; Structural Engineering, Mechanics, Railway Operation and Management. Thesis: Continuous Vierendeel Trusses.

Richard Marache Leighton, A.B., A.M.; Modern European History, English History, History of the Renaissance and Reformation. Thesis: The Tradition of the English Constitution in France on the Eve of the Revolution.

Ching-hai Li, B.S.C.E., M.C.E.; Geodetic Engineering, Mathematics, Physics. Thesis: On the Strength of Figures Used in Triangulation Reconnaissance.

Frederick William Loetscher, jr., A.B.; Ornithology, Mammalogy, Entomology. Thesis: Ornithology of the Mexican State of Veracruz with an Annotated List of the Birds.

Josephine Lumpkins, A.B., A.M.; American History, English History, Modern European History. Thesis: Antislavery Opposition to the Annexation of Texas, With Special Reference to John Quincy Adams.

Wilbur Dwight McClellan, B.S.; Plant Pathology, Plant Breeding, Plant Physiology. Thesis: The Control of Powdery Mildew of Roses in the Greenhouse.

John MacLeod, B.A., M.S.; Physiology, Biochemistry, Anatomy. Thesis: The Metabolism of Human Spermatozoa.

Coleman Joseph Major, B.S.; Chemical Engineering, Mechanical Engineering, Physical Chemistry. Thesis: The Extraction of Acetic Acid with Ethyl Ether in a Sieve-Plate Column.

Gabriel Raphael Mandels, B.S.; Plant Physiology, Cytology, Biochemistry. Thesis: A Quantitative Study of Chlorosis Induced in Chlorella by Sulfur or Nitrogen Deficiency.

Willard John Martin, B.Chem.; Physical Chemistry, Organic Chemistry, Physics. Thesis: The Crystal Structure of Potassium Oxypentafluocolumbate-Potassium Bifluoride and Sodium Octofluotantalate.

Woodrow Wilson Middlekauff, B.S., M.S.; Economic Entomology—Insect Toxicology, Ornithology, Botany. Thesis: Some Toxicological and Biological Studies with the Adults of the Apple and Cherry Maggots.

Reed Franklin Morse, A.B., B.S. in C.E., M.S.; Structural Engineering, Highway Engineering, Topographic and Geodetic Engineering. Thesis: Studies of Compaction and Other Properties of Soils for Low Cost Roads.

Raymond Tyson Moyer, A.B., M.S. in Agr.; Agronomy, Physical Chemistry, Plant Breeding. Thesis: Non-Symbiotic Nitrogen Fixation in Soils of a Semi-Arid Region of North China.

Henry Martin Munger, B.S., M.S.; Plant Breeding, Vegetable Crops, Plant Physiology. Thesis: Breeding Muskmelons, with Special Reference to the Possible Utilization of First Generation Hybrids.

Lowell Wendell Nielsen, B.S., M.S.; Plant Pathology, Plant Physiology, Physical Chemistry. Thesis: Studies with Silver Compounds and Mixtures as Fungicidal Sprays.

Laurence Earl Nugent, jr., B.A., M.S.; Structural Geology, Geomorphology, Stratigraphy. Thesis: Structure and Stratigraphy of the Kern River Salient.

Hermon Manley Parker, A.B., M.A.; Theoretical Physics, Experimental Physics, Mathematics. Thesis: Theory of the Deuteron with Twice the Usual Meson Mass.

Hans Heinrich Plambeck, B.A., M.A.; Rural Social Organization, Social Psychology of Rural Life, Prices and Statistics. Thesis: The Social Participation of Farm Families in Formal Organizations.

Hedley John Rayner, B.S., M.S.; Limnology and Aquiculture, Insect Ecology, Ichthyology. Thesis: The Development of a Management Policy for the Rainbow Trout of the Finger Lakes.

Malcolm Mackenzie Ross, B.A., A.M.; Seventeenth Century English Literature, The English Drama, Political Theory. Thesis: Milton's Royalism: A Study of the Conflict of Symbol and Idea in the Poems.

Jay Ruffner Schenck, B.S. in Chem., M.S.; Biochemistry, Physiology, Organic Chemistry. Thesis: Studies on B-Alanine, and its Derivatives, Carnosine and Anserine.

Andrew Schultz Schultz, jr., B.S. in A.E.; Administrative Engineering, Industrial Accounting, Industrial Statistics. Thesis: Application of Statistics in Administrative Engineering.

Nelson Jacob Shaulis, B.S., M.S.; Soils, Pomology, Plant Physiology. Thesis: Soil and Plant Response to Modified Sods and Mulches in a Young Peach Orchard.

Oved Shifriss, B.S.; Plant Breeding, Vegetable Crops, Cytology. Thesis: Artificially Induced Polyploids in the Genus *Cucumis*.

Arnold Jack Singer, B.S., B.Sc., M.S.; Pathogenic Bacteriology, Veterinary Parasitology, Public Health Engineering. Thesis: Studies on the Staphylococci Isolated from Animal Infections and on the Filtrates of Toxicogenic Staphylococci.

Gordon Edward Smith, B.S. in Ed., M.S.; Medical Entomology, Botany, Limnology. Thesis: The Development of a New Method For Determining the Densities of *Anopheles quadrimaculatus* in Relation to its Breeding Areas in the Tennessee Valley.

Russell Jack Smith, A.B.; The English Renaissance, The Classical Period, The English Drama. Thesis: Dryden and Shadwell: A Study in Literary Controversy.

Paul Leon Soper, B.A. in Ed., A.M.; Dramatic Production, Dramatic Literature, Speech and Phonetics. Thesis: Aesthetics and the Modern Theatre.

Mildred Gertrude Spicer, B.S., M.A.; Household Economics, Family Life, Education. Thesis: Major Equipment, Work Space, and Storage Space Found in 160 Farm and Village Homes in New York State, and Implications for Homemaking Education at the Secondary Level.

Clara Amanda Storvick, A.B., M.S.; Nutrition, Biochemistry, Animal Nutrition. Thesis: Studies on the Urinary Excretion of Ascorbic Acid and the Concentration of Ascorbic Acid in the Plasma of Normal Adults During Periods on Controlled Intakes.

Frances Ellenor Marguerite Swallow, A.B., M.A.; Greek Language and Liter-

ature, Latin Literature, Ancient History. Thesis: Theophrastus and the English Theophrastans: A Comparative Study in Greek and English "Charactery."

Robert Warren Torrens, B.S., A.M.; French Literature, Spanish Literature of the Golden Age, Spanish Literature. Thesis: The Social and Political Ideas of Romain Rolland.

John Howard Van Dyke, A.B., M.S.; Histology and Embryology, Anatomy, Animal Pathology. Thesis: The Pharyngeal Complex IV and its Relation to the Thyroid Gland in Mammals with Particular Reference to Man and Sheep.

David Hartle Walter, B.S., M.S.; Farm Management, Economic Theory and its History, Marketing. Thesis: The Influence of the Soil Conservation Program on Farm Organization and Operation in the Crooked Creek Project Area of Western Pennsylvania.

Charles Gilmore Warner, A.B., A.M.; Literary Criticism, Mediaeval Literature, English History. Thesis: Materials for an Edition of Milton's *History of Britain*.

John Yin Chieh Watt, B.A., M.S.; Parasitology, Pharmacology, Bacteriology. Thesis: Studies on Rat Immunity to Nematode, *Nippostrongylus Muris*.

James Ross Westman, Ph.B.; Limnology and Fisheries, Ichthyology, Mammalogy. Thesis: A Consideration of Population Life-History Studies in their Relation to the Problems of Fish Management Research; with Special Reference to the Small-Mouthed Bass, *Micropterus dolomieu* Lacépède; the Lake Trout, *Cristivomer namaycush* (Walbaum); and the Mud Minnow, *Umbra limi* (Kirtland).

Rollo Eugene Wicks, A.B., A.M.; American History, English History, Education. Thesis: A Survey of Political Leadership in the South with Reference to Federal Economic and Social Legislation 1933–1940.

Elwin Linton Willett, B.S., M.S.; Animal Husbandry, Animal Nutrition, Genetics. Thesis: Studies on the Preservation and the Physiology of Spermatozoa.

Max Bullock Williams, B.S., M.S.; Physical Chemistry, Organic Chemistry, Physics. Thesis: The Crystal Structures of Ammonium Hexafluosilicate-Ammonium Fluoride and Potassium Oxyhexaflucolumbate.

Sheldon Ward Williams, B.S., M.S.; Farm Management, Marketing, Economic Theory. Thesis: Dairy Farm Management in the Champlain Valley of Vermont, and its Relation to the Price Level.

John Martin Witzel, A.B., A.M.; Organic Chemistry, Physical Chemistry, Inorganic Chemistry. Thesis: Dimethylketene and its Reaction with cyclopentadiene.

Martin Dwight Woodin, B.S., M.S. in Agr.; Marketing, Prices and Statistics, Public Administration and Finance. Thesis: A Study of Changes in the Prices of Apples and Other Fruits.

William Dean Wray, A.B., A.M.; Statistics, Analysis, Algebra. Thesis: Some Applications of Uniformity Trials.

William Dickey Wylie, B.S.A.; Economic Entomology, Insect Taxonomy, Plant Breeding, Insect Toxicology. Thesis: A Study of Some New York Cutworms with Reference to Biology and Toxicology.

INDEX OF MEMBERS OF THE STAFF

INDEX